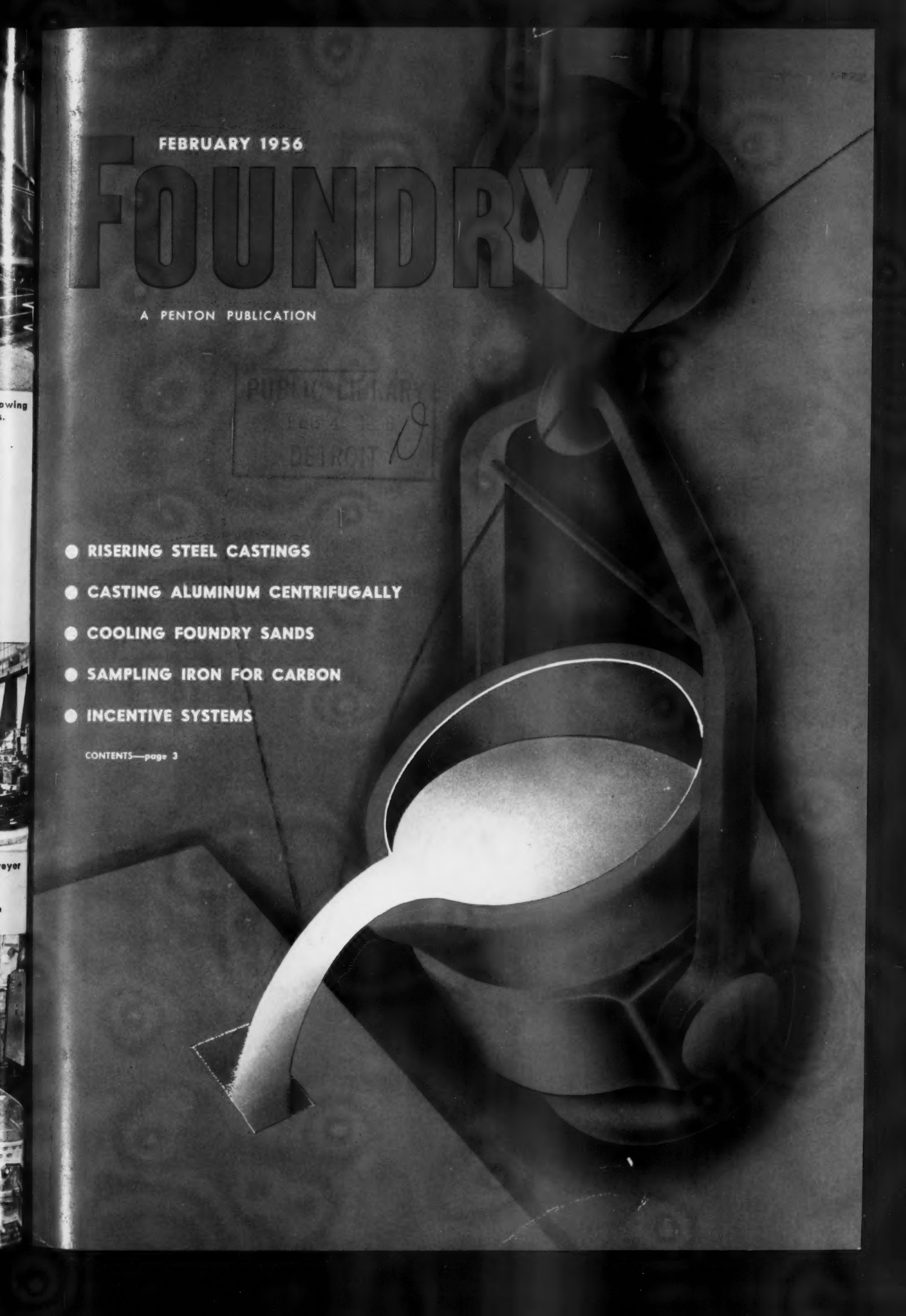

FEBRUARY 1956

FOUNDRY

A PENTON PUBLICATION

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DETROIT

- RISERING STEEL CASTINGS
- CASTING ALUMINUM CENTRIFUGALLY
- COOLING FOUNDRY SANDS
- SAMPLING IRON FOR CARBON
- INCENTIVE SYSTEMS

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PURITE saves money 8 ways!

1. Purite produces higher percentages of finished castings—fewer rejects per ton of metal poured.
2. Purite gives 100% fluxing action in the cupola —100% desulphurizing action in the ladle.
3. Purite is time-tested and proved for rapid and unsurpassed desulphurizing uniformity.
4. Purite permits the use of higher-sulphur raw materials.
5. Purite is 100% pure fused soda ash—you do not pay for inert materials.
6. Purite comes in uniform 2-lb. pigs—no weighing or measuring required.
7. Purite does not crumble—is easy to handle —no waste, no dust.
8. Purite can be shipped in bulk carloads at substantial savings over bag shipments—is easily stored without deterioration.

Purite, the scientific flux for better melting and cleaner iron, is sold by leading foundry supply houses in the United States and Canada.

MATHIESON

MATHIESON CHEMICALS

OLIN MATHIESON CHEMICAL CORPORATION

INDUSTRIAL CHEMICALS DIVISION · BALTIMORE 3, MD.

Joints serving hot lines

...or how Chuck Wright handles cracks when the heat's on

"Drexel Foundry had a hunk of trouble with expansion joints they poured for the Phoenix plant," said Chuck. "Even though they met Phoenix specs, the castings kept cracking in lines handling process liquids. One joint, in service about six months, simply went to pieces," he added. "Al Hipp of Drexel then called me to come over.

"Test bars showed that Al used a mix meeting specs for iron of 35,000 psi. No mistake, either. The lab book showed it as room temperature strength. Furthermore, Drexel's foundry practices were tops.

"So my question was, 'Al, what temperatures must a joint handle?'

"Rummaging through a ream of Phoenix letters, he answered, *'Gases from 650° to 800°F.'*

"Now, a strength of 35,000 psi at room temperatures falls to 28,000 psi in the 650° to 800°F range. For safety, it should be higher than 35,000 to start with.

"Replacement castings...now in the Phoenix pipe line for many months...contain 1½% nickel. Their good service shows that a *little* nickel gives iron a *lot* of additional strength, toughness and hardness.

"What some fellows may *not* know, is that nickel also slows down deterioration. Nickel irons retain a high proportion of their original properties despite heat.

"Like a good sailor, always know where you're going. Don't trust to luck where the metallurgy of castings is involved. Call on me when you want some practical help. Easiest way to reach me is through INCO."

Chuck Wright

The International Nickel Company, Inc.

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FEDERAL's mines and refineries in the finest bentonite producing areas in Wyoming and South Dakota comes...

FEDERAL GREEN BOND BENTONITE

"the best of the bentonites"

- ★ LOW TO MEDIUM VISCOSITY
- ★ LOW GELATINATION
- ★ HIGH GREEN BOND STRENGTH
- ★ HIGH DRY BOND STRENGTH
- ★ AVAILABLE IN PULVERIZED, GRANULAR OR SLURRY GRADES

If it's better, more uniform sand control you're after— write for a copy of "Tailor-Made Molding Sands".

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FOUNDRY
A PENTON PUBLICATION

February 1956
Volume 84—Number 2

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(For addresses of branch offices, see page 265)

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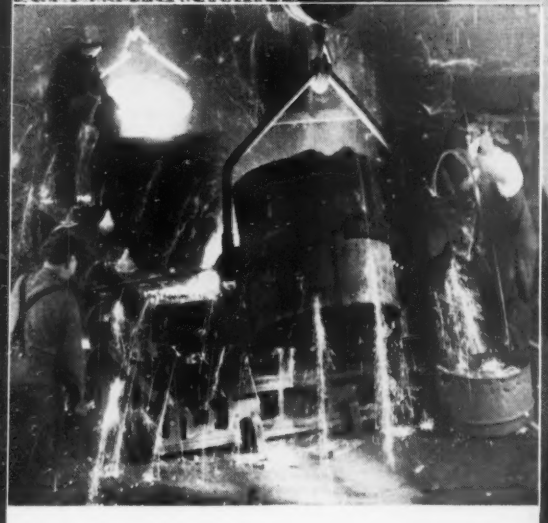
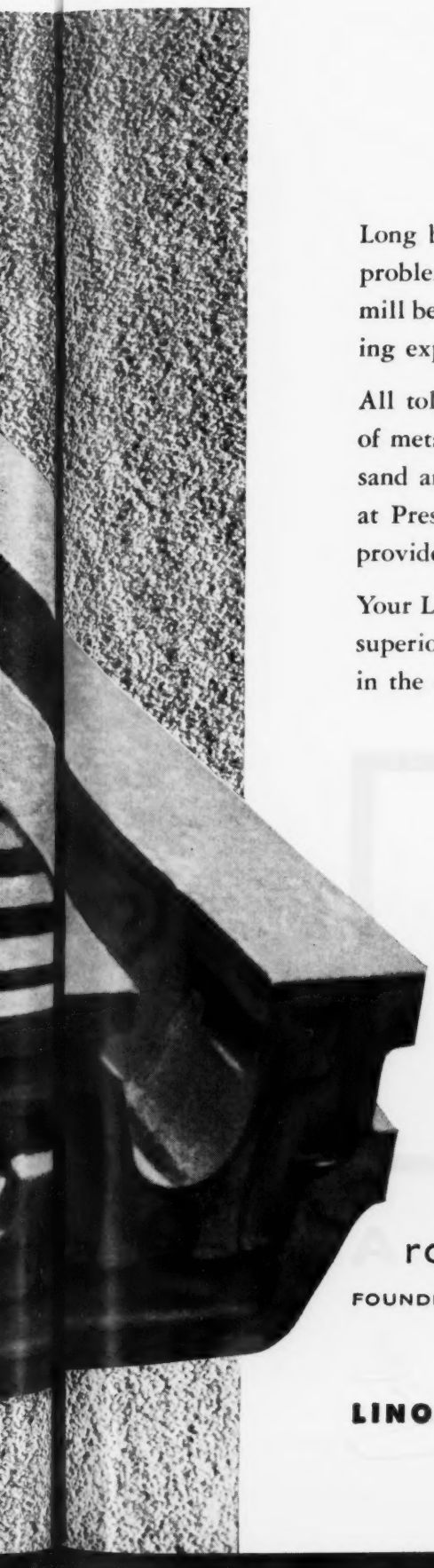
BRUTE



The Prescott Company pours 32 tons of metal to make one casting for a skin mill bed plate. Using four ladles, it takes four minutes to pour one casting.

CASTING



CONSUMES 126 GALLONS OF LINOIL

Long before a skin mill starts turning out airplane wings, production problems arise. For instance, making the intricate, 30-ton castings for the mill bed plate was a problem until The Prescott Company took over. Combining expert craftsmanship with the finest of materials, Prescott did the job.

All told, they poured 32 tons of metal for each casting . . . only two tons of metal for risers, gates and sprues. The core mix included 37 tons of core sand and 126 gallons of LINOIL per casting. Dependable LINOIL is used at Prescott Company. That's because it is always uniform. LINOIL also provides the workability and thorough baking qualities these castings demand.

Your LINOIL man has more than 50 grades of LINOIL to help you produce superior castings. And he's backed by the largest technical service organization in the core binder business. Why not call him today?

CASTING STATISTICS

Foundry	**The Prescott Company, Menominee, Mich.**
Size of casting	22 feet long, 8 feet wide, 3 feet high
Number of cores	64
Total core weight	1,200 lbs.
Weight of casting	30 tons
LINOIL used	about 126 gallons
Core sand used	37 tons
Pouring time	4 minutes using 4 ladles
Metal	Meehanite, Type GC; 45,000 lbs. tensile strength; 200 Brinell hardness

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FOUNDRY PRODUCTS DIVISION · 2191 WEST 110th St., CLEVELAND 2, OHIO

LINOIL · INDUCTOL · LIN-O-CEL · FREFLO · ADMIREZ

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER

Where a B. F. Goodrich belt cut labor costs 90%

IT used to take a man an hour or two a day to clean up the mess around that conveyor belt. Sizzling hot sand, from casting molds, is dumped on the belt and carried to storage.

A woven asbestos belt was used, but it had to have "first aid" every three weeks—a sticky dressing to protect it from the 300 degree heat. Then the steaming sand would cling to the belt cover. Some would build up on the return idlers, a great deal dropped on the floor. Clean-up time was costing the company $900 a year.

Then a B. F. Goodrich man told them his company had developed a special heat-resisting rubber for belts carrying such things as hot sand, lime, nitrates. Instead of ordinary fabric, B. F. Goodrich uses *glass* fabric to make a belt that can stand extreme heat.

The foundry installed this B. F. Goodrich belt. It runs 8 hours a day, 5 days a week, handles 75 tons an hour. Since it needs no liquid dressing, there's no sticking, no spillage. Clean-up time has been cut to once every 3 weeks.

Making a belt that stands terrific heat is typical of B. F. Goodrich product improvement. Other BFG improvements have resulted in Grommet V belts that last 20 to 50% longer, rubber linings which reduce the cost of handling acid and at the same time protect workers from injury—and hundreds of other products that last longer, serve better. To take full advantage of these many and frequent improvements, call in your BFG distributor or write *The B. F. Goodrich Company, Dept. M-523, Akron 18, Ohio.*

B.F.Goodrich
INDUSTRIAL PRODUCTS DIVISION

How Dodge Manufacturing Corporation designs pillow blocks that pack more capacity in less space

THESE design features make Dodge-Timken pillow blocks ideal for use where big load capacity in small space is needed: (1) All-steel construction gives extra strength. (2) No space-consuming special thrust devices are needed, because the Timken® tapered roller bearings used take *both* radial and thrust loads in any combination. (3) Timken bearings have high load capacity because of their *full line contact* between rollers and races.

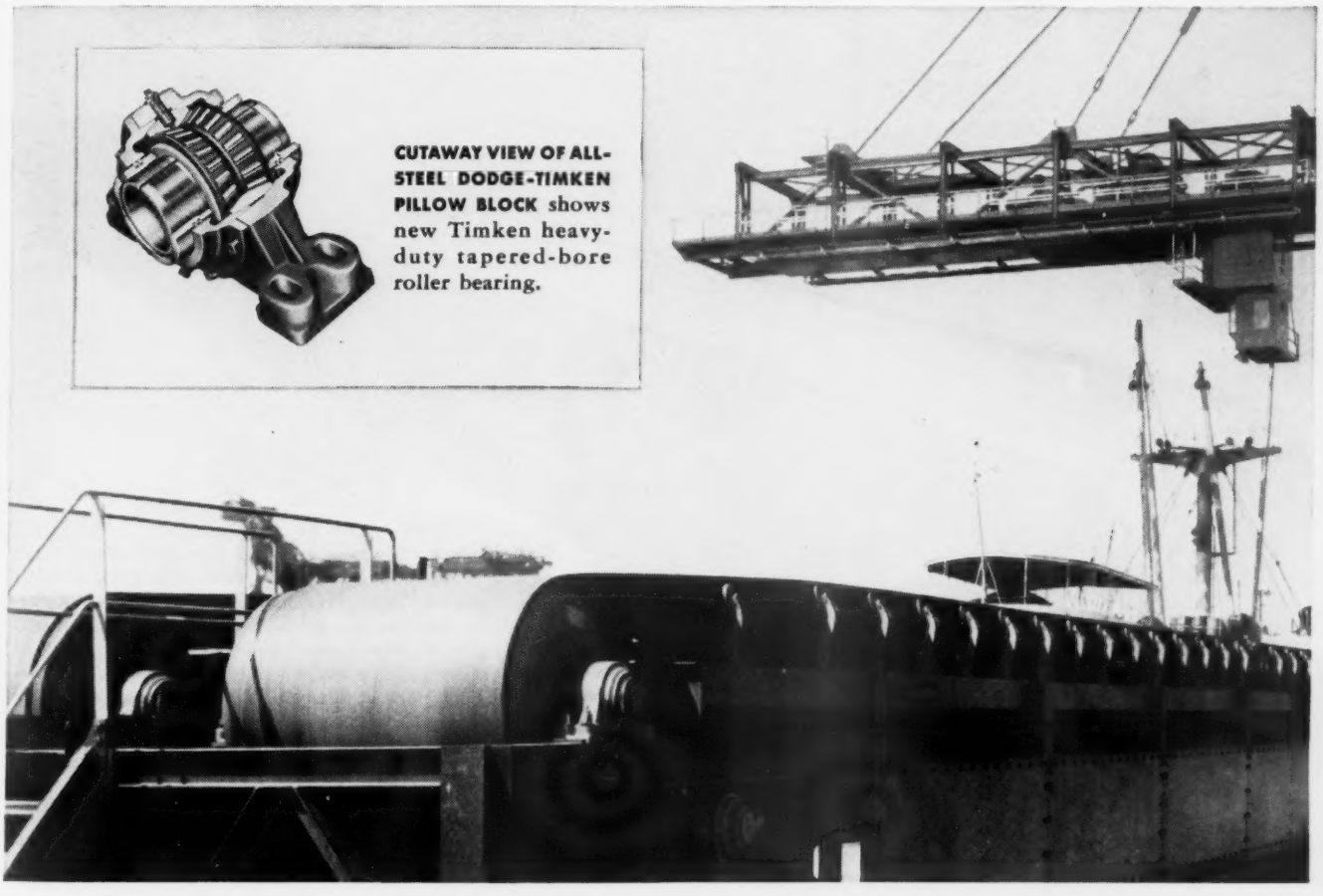
The Dodge-Timken pillow blocks shown below support all head, tail and take-up pulleys on this conveyor belt which transports ore from ships to railroad cars. Timken bearings take the shock loads because all rollers and races are made of case-carburized steel, with tough, impact-resistant cores under hard, wear-resistant surfaces.

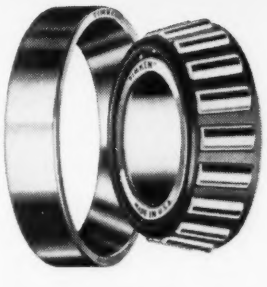
The Dodge-Timken All-Steel pillow blocks on this conveyor utilize a special new type of Timken heavy-duty, self-aligning tapered-bore roller bearing. The pillow block is one of many expansion and non-expansion types made by Dodge Manufacturing Corporation for general power transmission and machine applications; such as Type E, Double-Interlock, Type C and Special-Duty blocks. All are factory-sealed against abrasive dust and dirt.

Be sure you get all the advantages of Timken bearings when you buy or build pillow blocks, or any equipment. The Timken Company is America's only bearing manufacturer who makes its own steel. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

CUTAWAY VIEW OF ALL-STEEL DODGE-TIMKEN PILLOW BLOCK shows new Timken heavy-duty tapered-bore roller bearing.





TIMKEN

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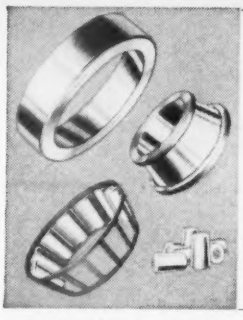
TAPERED ROLLER BEARINGS



DESIGN LEADERSHIP

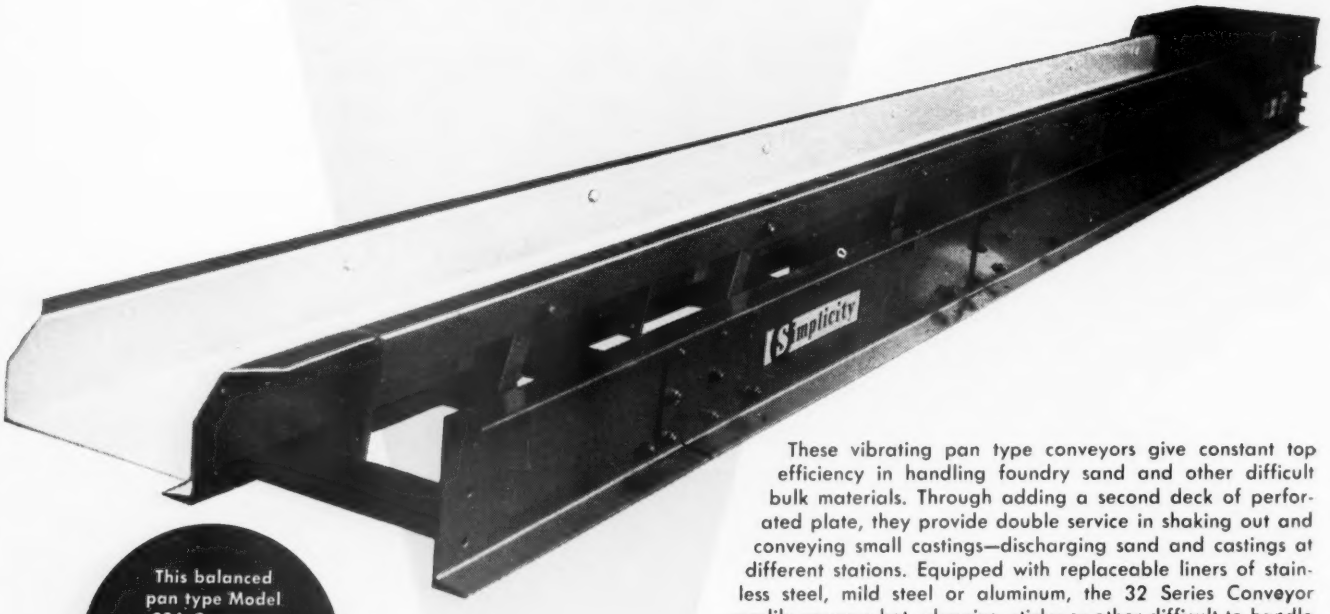
The first Timken tapered roller bearing was produced in 1898. Since then the one-piece multiple perforated cage, wide area contact between roller ends and ribs, and every other important tapered roller bearing improvement have been introduced by The Timken Roller Bearing Company.

Only Timken tapered roller bearings have these advantages: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. Timken fine alloy steels.

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◐ AND THRUST ⊣○⊢ LOADS OR ANY COMBINATION

SIMPLICITY . . . balanced pan type conveyors can solve your materials handling problem

From prepared sand to hot castings, materials are better handled on Simplicity foundry equipment



This balanced pan type Model 32A Conveyor will fit where space is minimum, allow more headroom, and need little supporting structure.

These vibrating pan type conveyors give constant top efficiency in handling foundry sand and other difficult bulk materials. Through adding a second deck of perforated plate, they provide double service in shaking out and conveying small castings—discharging sand and castings at different stations. Equipped with replaceable liners of stainless steel, mild steel or aluminum, the 32 Series Conveyor readily conveys hot, abrasive, sticky or other difficult to handle materials. Readily adaptable for returning shot to shot blast cabinets. With baffles and staggered discharge openings, it discharges sand evenly over a silo. Available with four different assemblies, depending on volume and weight of materials to be handled. There is a Simplicity Conveyor in the exact size for your materials handling system—to give you uninterrupted operation and lower maintenance—a steady product flow—when you want it—where you want it.

SEND FOR BULLETIN 3255 TODAY!

• SHAKEOUTS & KNOCKOUTS • PORTABLE SAND CONDITIONERS • OS-A-VEYOR FEEDERS & CONVEYORS

158-A

SALES REPRESENTATIVES IN ALL PARTS OF THE U.S.A.

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TRADE MARK REGISTERED

ENGINEERING COMPANY • DURAND 7, MICHIGAN

The four Type N ROTO-CLONES shown above are only a few of the total number installed in this large automotive parts manufacturing plant.

ROTO-CLONES Rout Grinding and Buffing Dust

DUST, of course, is a natural by-product of grinding and buffing. But nature isn't allowed to take its destructive course in *this* automotive parts plant—AAF ROTO-CLONE dust control units are on the job, every minute of the working day.

The compact, self-contained Type N ROTO-CLONE exhausts, collects *and stores* dust, in the form of sludge. The high cleaning efficiency of this hydro-static precipitator results from the combined action of centrifugal force and thorough intermixing of water and dust-laden air. Type N's compensating water level assures this high cleaning efficiency over a wide range of exhaust volumes.

Type N ROTO-CLONES are available in exhaust volumes up to 50,000 cfm. For complete product information, call your local AAF representative or write direct for Bulletin 277.

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Herman Nelson Unit Heaters

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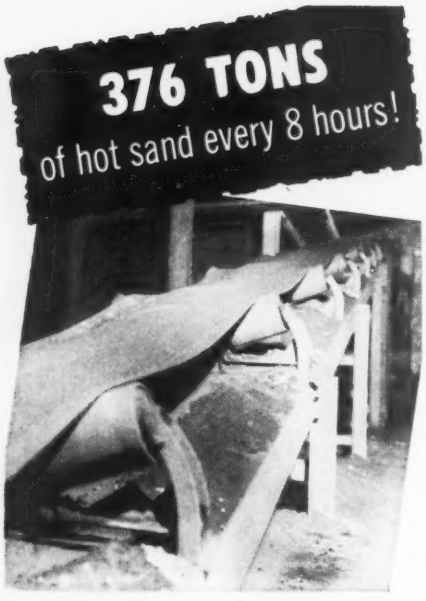


That's the load this Imperial Belt handles

In the Landers, Frary & Clark foundry at New Britain, Conn., this Imperial Standard Sahara Belt receives 250 F. sand from the shake-out and carries it to the mixers.

Operating at a speed of 100 feet per minute, it moves 47 tons of sand per hour . . 376 tons every 8-hour day!

Made to last longer. Danger of damage by heat and abrasion is high. In addition, there are gaggers in the sand for about half the belt length, until removal by a magnet. But Imperial's super-tough construction of heavy-duty hard silver duck enables it to withstand this rigorous service . . . performing satisfactorily day-after-day without costly shut-downs for maintenance.

The five plies of this belt (132′ x 18′) are double stitched with inner-locking stitches to positively prevent ply separation. Imperial's exclusive impregnating compounds lubricate and toughen the base fabric and insulate it against the destructive action of sustained temperatures to 300° F. and temporary peaks of 350° F. Other Imperial Belts are made to withstand temperatures as high as 600° F.

Job-designed belting. Whatever your belting needs, there is an Imperial job-designed belt that will outperform any other belting made and give you lowest long-time operating cost. Write for Data Sheet 54-2 and describe your belting problem.

Imperial
BELTING CO.
1755 S. Kilbourn Ave., Chicago 23, Ill.

You expect more from Imperial . . . and you get more!

With the EDITORS

SCRAP: Have you registered a protest on the scrap export situation? If you believe that present shipments of good scrap from this country are excessive, that they constitute a menace to our security, that they are contributing to an unnecessary inflationary spiral, and that they are endangering the economic well being of many foundries coming under the category of small business, you should tell your senators and congressman about it. Seemingly, such protests provide the only way to remedy this unhealthy situation.

—o—

Silence: The following clipping from the *Vancouver Providence* has been kindly provided by J. T. Hornby, Balfour Guthrie, Vancouver, B.C.:

Silence emanating today from the vicinity of Third and Ontario is the noise of Sam Nichols NOT shouting through his megaphone.

Mr. Nichols was restrained Monday by order of Mr. Justice McInnes from "declaiming by megaphone" from the second floor of his new home at 1831 Ontario.

A 1 Steel & Foundry Ltd., 16 West Third, won an injunction on the ground that Mr. Nichols' megaphoning was endangering the firm's employees, especially when they poured molten steel.

Thomas I'Anson, the foundry manager, said Mr. Nichols' messages first began coming through loud and clear in September 1952 and haven't abated since. In a sample broadcast, he said, Mr. Nichols expressed the fond hope that the factory would burn down.

Silence Is Golden!

—o—

The First Heat: Pouring the first heat at the new steel foundry of Texas Foundries Inc., Lufkin, Tex., was quite an affair. The house organ of that organization, *The Foundry Conveyor,* points out: As an eager, expectant crowd of onlookers, headed by Col. Chambers, R. S. Bradshaw and Harlie Freeman, stomped around in the chill night air, official operations of the steel foundry began with the pouring of the first heat at 10:17 p.m. Monday, Nov. 28. Tapping of the first heat began at 10:12 p.m. with Melter Ed Dobrec at the controls."

Further on in the story, it was mentioned that "Jim Hewitt, J. O. Klein and Eli Stud were on hand to assist in the heat, inasmuch as all of these men had previous steel foundry experience." It really looks as if the boys in the steel foundry had to put up with plenty of kibitzing before melting and tapping was completed and the metal was poured into the molds.

Industry in the rapidly growing Southwest should welcome this additional steel foundry capacity for the area.

—o—

Professor at Work: Students in foundry practice at the University of Illinois, probably are getting more out of their course this year because Prof. James L. Leach of that organization spent some time this summer at the foundry of Caterpillar Tractor

Co., Peoria, Ill. The summer program is based on the mutual exchange of engineering information. The illustration shows him and F. K. Butterfield, general foreman, foundry conversion, discussing cupola operations.

—o—

Old Timers: During the holiday I had a nice letter from John A. Moore, connected with the foundry industry in the Detroit area and numerous other parts of the county for many years. John is at the Masonic Home, Alma, Mich., and of course he would like to hear from old friends. He reports good health and indicates he gets into a foundry once in a while.

H. H. Miller, proprietor of the Miller Brass Foundry, Aparado 19F, Torreon, Coah, Mexico, writes that at 80 he still gets around the foundry and directs the work. Mr. Miller has been a reader of FOUNDRY for 40 years, but failing eyesight has forced him to discontinue his subscription.

Messrs. Miller and Moore were great friends of the late Pat Dwyer, engineering editor of FOUNDRY for many years.

—o—

Castings for Navy: For several years the Navy has had an order that only steel machine tools would be permitted on board a combatant or auxiliary vessel. Recently we have a report that this order has been re-

Harbison-Walker Refractories

serve the specialized requirements of malleable foundries

for air furnaces...

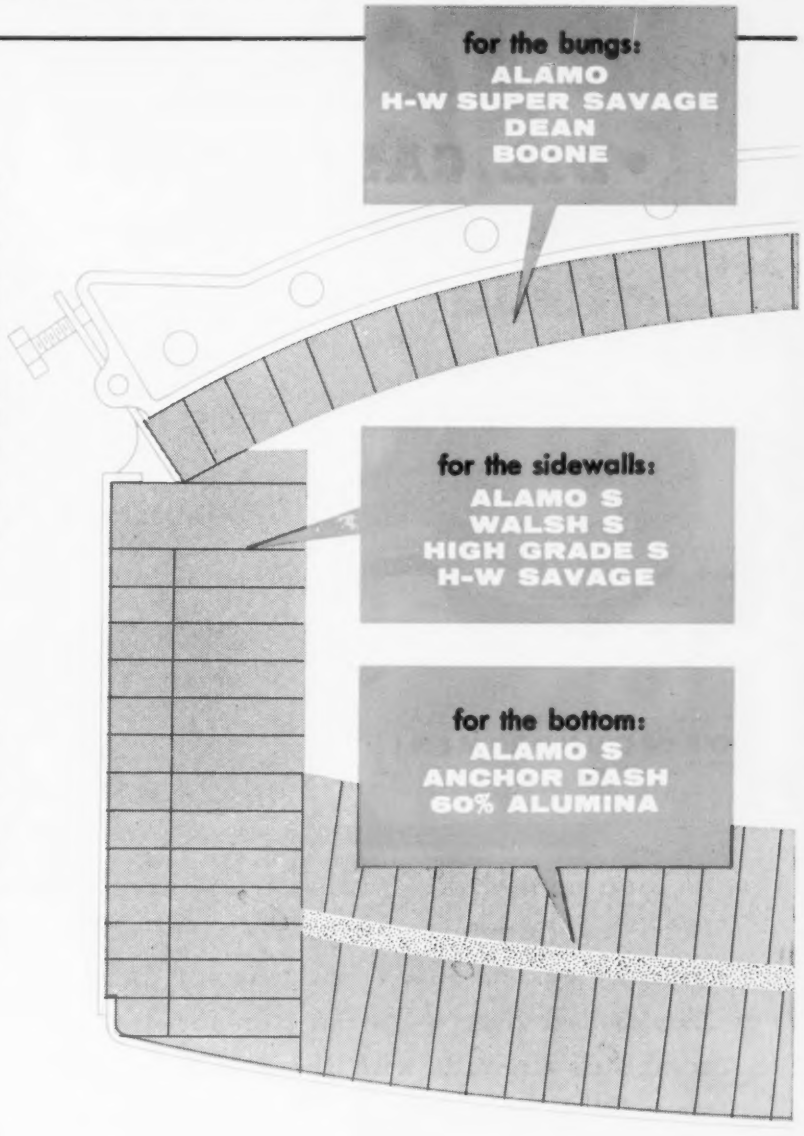
The careful selection of refractories will assist in achieving most desirable furnace performance. Some of the Harbison-Walker refractories that have proved to be most effective in bungs, walls and bottoms are indicated in the drawing at the right. In addition to these, H-W MULLITE, CORALITE, and other H-W high-alumina refractories along with corresponding mortars are used in the most vulnerable positions and contribute to uniform, balanced service life. The optimum choice of brands depends largely on the individual furnace operating conditions and plant locations for the lowest transportation costs.

for annealing furnaces...

The most suitable combination of refractories and insulation will result in improved furnace economy. Complementary to various brands of fireclay brick, Harbison-Walker provides six classes of insulating fire brick, each of which is especially suited for a specific temperature range and for the particular operating conditions involved. The over-all temperature range for these H-W Insulating Fire Brick is 1600°F. to over 3000°F.

for cupolas and ladles...

A noteworthy development in cupola linings is the Harbison-Walker Universal Cupola Block—a single shape for all diameters. For monolithic melting zone linings and for patching H-W KUPLOMIX is exceedingly effective. H-W EXTRA STRENGTH CASTABLE is used in the charging zone lining, for maximum strength and wear resistance. H-W BLACK PATCH is a plastic refractory of super-duty quality containing graphite, which is especially suited for use in cupola breast walls and for spouts, runners and ladle linings.



WHEREVER METAL IS CAST

Harbison-Walker provides quality controlled refractories for all types of foundry furnaces. Whatever the metal—gray iron, steel, malleable iron or any of the non-ferrous metals—the proper selection and application of Harbison-Walker products will result in longest refractory service life and maximum economy.

HARBISON-WALKER REFRACTORIES COMPANY

AND SUBSIDIARIES

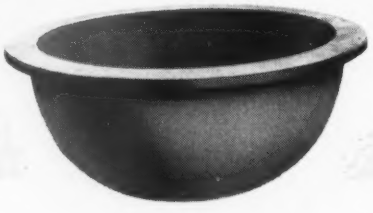
World's Largest Producer of Refractories

General Offices: Pittsburgh 22, Pennsylvania

Reduce Replacement Costs with Acme

- DIE CAST POTS
- MELTING POTS
- INGOT MOLDS

. . . DESIGNED BY FOUNDRYMEN



FOR FOUNDRYMEN!

Melting non-ferrous metals? You'll save with Acme melting pots and ingot molds. They require less frequent replacement because they're cast from a special iron formula that combines strength with the ability to withstand high temperatures. They improve production, too, because they're designed for even distribution of heat without hot spots. More than 30 years' experience in this field is your assurance of high quality in Acme melting pots and ingot molds . . . designed *by* foundrymen, *for* foundrymen.

Quick delivery anywhere in the United States. Write for size list showing 40 standard sizes.

Acme FOUNDRY CO.

2502 22nd St. • DETROIT 16, MICH. • *Phone* TAshmoo 5-2404

laxed and that major castings now may be made of nodular iron. This will be an interesting development to machine tool builders and many foundrymen.

—o—

Somebody Goofed: We got an order from one of our larger companies the other day asking for a copy of the article *"Careless* Induction Furnaces Melt Alloy Steel, Plain Carbon Steel, Gray Iron and Bronze for Cast Products" published in the July, 1932 issue. Things really were tough back in those days.

—o—

50 Years in Pipe: Dr. James T. MacKenzie has sent me a copy of "People and Pipe," a booklet published by the American Cast Iron Pipe Co., Birmingham, to celebrate "50 years of pipe progress at Acipco." The work is beautifully done and provides a fine tribute to the memory of John Joseph Egan "whose Christian philosophy, dreams and aspirations have made possible a better way of life for thousands who have worked and are now working for American Cast Iron Pipe Co.," to Susan Young Egan, his widow, who has served on the board of directors since 1924 and has helped to carry on his dreams, and to all of the men and women who, over the years, have contributed to the development and success of that great company.

Students of foundry history will be interested in the story of the early beginning of the company, production in the pit casting days, and the development of the centrifugal method. Stress is laid on the recreational opportunities of Acipco employees, activities of the company during the war, and a look at the organization today and tomorrow.

Congratulations to President Steve Moxley and all Acipco employees on the 50th anniversary and the excellent publication marking that event.

—o—

Changes Coming? Bob Herrmann has had a number of interesting comments on his fine article in the January, 1956, issue entitled "The Automotive Gas Turbine—A Challenge to Foundries." The praise is well deserved for Bob has done an excellent job of market research which should be of vital interest to any foundryman who has supplied castings to the automobile field, or who would like to get some business in that particular area. If you missed the article, I would suggest you look up last month's issue and see what changes those dreamers in the automobile industry are planning for the millions of car owners, and how the plans for a new type of engine may affect you.

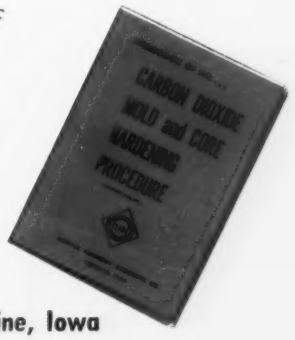
F.G.S.

Now you can HARDEN CORES in 12 seconds by the magic of the CO_2 PROCESS using STEINEX*

* **STEINEX** is a remarkable core sand binder. Cores and shell molds, made of sand mixed with STEINEX, can be hardened right in the corebox in a few seconds by the injection of carbon dioxide.

STEINEX

Get your FREE copy of the new 36-page "HANDBOOK OF THE CARBON DIOXIDE MOLD AND CORE HARDENING PROCEDURE." Write today.



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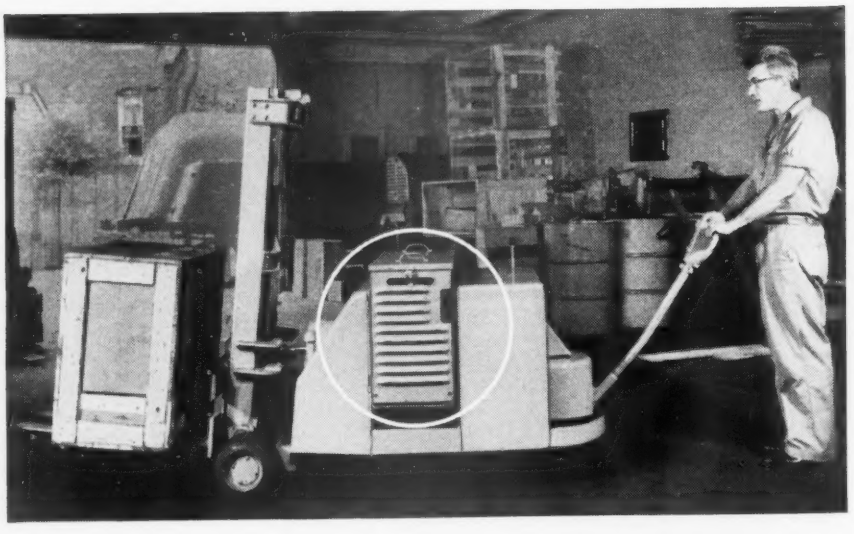
CARVER FOUNDRY PRODUCTS CO.

1060 Hershey Ave. • AMherst 3-1845 • Muscatine, Iowa

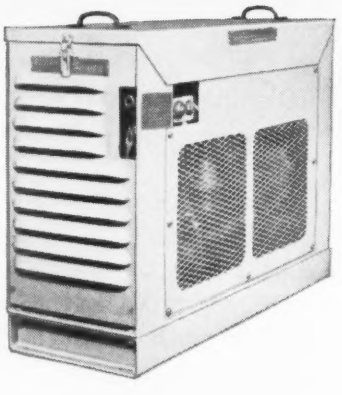
The Most Versatile Power Unit Ever Developed For Small Trucks

READY-POWER BANTAM MODEL W



Only the compact new Bantam Model W provides smooth, dependable gas-electric power that can be quickly interchanged from truck to truck.

A new high-performance unit features 12-volt automotive-type starting and ignition system plus complete choice of idling speed. Full access to engine and generator simplifies adjustment, even on the truck. Fits practically all makes of walkie and rider trucks up to 2000 lbs. *Write today for full information.*



READY-POWER

The READY-POWER Co., 3819 GRAND RIVER AVE., DETROIT 8, MICH.

Manufacturers of Gas and Diesel Engine-Driven Generators and Air Conditioning Units; Gas and Diesel-Electric Power Units for Industrial Trucks

CALENDAR of Meetings

Feb. 6-9—Ventilation Conference, Michigan Department of Health and Michigan State University, Kellogg Center, Michigan State University, East Lansing, Mich.

Feb. 9-10—Wisconsin Regional Foundry Conference, Hotel Schroeder, Milwaukee.

Feb. 16-17—Southeastern Regional Foundry Conference, sponsored by Birmingham and Tennessee Chapters, AFS, Tutwiler Hotel, Birmingham.

Feb. 19-23—American Institute of Mining & Metallurgical Engineers, annual meeting, Hotels Statler and New Yorker, New York.

Feb. 27-Mar. 2—American Society for Testing Materials, spring meeting, Hotel Statler, Buffalo, N. Y.

Mar. 7-8—Foundry Educational Foundation, college-industry conference, Hotel Cleveland, Cleveland.

Mar. 19-20—Steel Founders' Society, annual meeting, Drake Hotel, Chicago.

Apr. 3—Material Handling Institute, spring meeting, Edgewater Beach Hotel, Chicago.

Apr. 3-4—Industrial Truck Association, spring meeting, Edgewater Beach Hotel, Chicago.

Apr. 12-13—Malleable Founders' Society, annual market development conference, Edgewater Beach Hotel, Chicago.

Apr. 18-19—Armour Research Foundation, Illinois Institute of Technology, national industrial research conference, Hotel Sherman, Chicago.

May 3—Non-Ferrous Founders' Society, annual business meeting, dinner and reception, Marlborough-Blenheim Hotel, Atlantic City, N. J.

May 3-9—American Foundrymen's Society, annual convention and exhibition, Convention Hall, Atlantic City, N. J.

May 9-11—American Welding Society, spring meeting and 4th welding and allied industry exposition, Buffalo.

May 10-11 — Refractories Institute, annual meeting, Grand Hotel, Point Clear, Ala.

May 20-23—Industrial Heating Equipment Association, spring meeting, The Homestead, Hot Springs, Va.

June 5-8—Material Handling Institute, exposition, Cleveland Public Auditorium, Cleveland.

June 11-12—Malleable Founders' Society, general meeting, The Homestead, Hot Springs, Va.

June 17-22—American Society for Testing Materials, annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

June 24-26—Alloy Casting Institute, annual meeting, The Homestead, Hot Springs, Va.

Sept. 1-9—Association of German Foundrymen, International foundry exhibition and trade fair, Dusseldorf, Germany.

Sept. 11-13—American Die Casting Institute, annual meeting, Edgewater Beach Hotel, Chicago.

Sept. 17-21—Instrument Society of America, instrument-automation conference and exhibit, Coliseum Bldg., New York.

Sept. 24-25—Steel Founders' Society of America, annual fall meeting, The Greenbrier, White Sulphur Springs, W. Va.

Sept. 24-26—Material Handling Institute, fall meeting, The Greenbrier, White Sulphur Springs, W. Va.

Oct. 4-5—Magnesium Association, annual meeting, Drake Hotel, Chicago.

Oct. 11-12—National Foundry Association, annual meeting, Detroit.

Oct. 18-20—Foundry Equipment Manufacturer's Association, annual meeting, The Greenbrier, White Sulphur Springs, W. Va.

Oct. 20-23—Conveyor Equipment Manufacturer's Association, annual meeting, The Greenbrier, White Sulphur Springs, W. Va.

Oct. 29-30—Refractories Institute, fall meeting, The Homestead, Hot Springs, Va.

Oct. 30-Nov. 2—Gray Iron Founders' Society, annual meeting, The Homestead, Hot Springs, Va.

THE TABOR MAN

TM

IS A TECHNICAL MAN

No "order taker", the Tabor Man is a Trained Man . . . one who knows the foundry business. He knows how, when and where to modernize, mechanize, or install automation . . . how to combat obsolescence. And he recognizes that no two foundries have exactly the same problems. The services of the Tabor Man are available to *you*—without obligation.

Let the TABOR MAN,

the TECHNICAL MAN, help you with

THE 5M's OF PROFITABLE FOUNDRY PRACTICE

TAKE THIS TABOR TEST

The 5M's below are the *bench-marks of profitable foundry practice.* Answer the questions TRUE or FALSE—*in terms of your own operations.* If you have 5 TRUE answers you can count yourself in very good shape. One answer in the FALSE column means that you might well take a fresh look at your operations.

	T	F
MACHINES		
My foundry machines work at optimum rates. They show no signs of obsolescence	☐	☐
METHODS		
My foundry methods can't be improved. There are no antiquated practices or tradition at work in my plant. And setting cores, pouring, cooling, shakeout and disposition of castings are no problem in my plant . .	☐	☐
MEN		
My men are as productive as it is possible to make them. There is no waste manpower	☐	☐
MATERIALS		
The materials used in my foundry are the best and most modern available. I can see no reason to change them	☐	☐
MECHANIZATION		
I can't see this mechanization business. I don't see how I can increase productivity by substituting mechanical devices for some manual operations	☐	☐

The Tabor Man would be happy to discuss your foundry operations with you. This can be as brief as you want it to be, and there's obviously no obligation of any sort. Why not save yourself time and trouble by getting in touch with us?

THE TABOR MANUFACTURING CO.
Lansdale, Pa.

Manufacturers of Foundry Molding Equipment and Cutoff Machines
Division of Turbo Machine Company

TABOR

(Advertisement)

BY—TOM BARLOW *Eastern Clay Dept., International Minerals & Chemical Corp.*

ARE YOU GIVING AWAY 6% OF YOUR METAL?

"... For the want of a rider the battle was lost,
For the want of a battle the kingdom was lost,
And all for the want of a horseshoe nail."

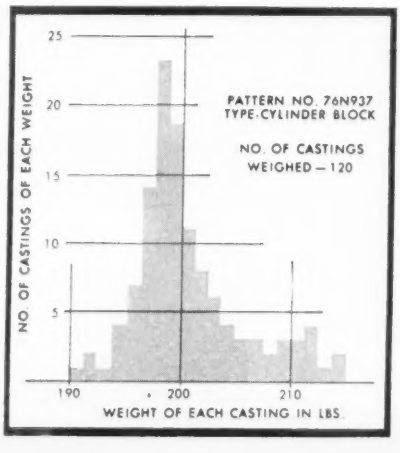
—from an old time foundryman, Ben Franklin, "Poor Richard's Almanack"

Remember the old saw about "For want of a nail, the shoe was lost, etc." As I remember (very vaguely), it went on at some length to prove that the little things can determine the ultimate success of a battle. Since running a foundry is a battle (as I remember), the same philosophy may apply.

Just as a good place to start, let's kick around the idea of excess weight caused by some degree of soft ramming. Much to our surprise, we soon find that overweight is every day practice, everywhere. As a matter of fact, the average foundry may be giving away (for free, no less) 6% of its metal.

How about running a little test in your foundry. You could do it just for the fun of proving me a liar or just out of cussed curiosity.

Take any given pattern (or more than one if you are ambitious) and weigh 120 castings, one at a time. You could take them all from one day's run or even better, take ten a day for 12 days. Then make a bar chart or distribution chart like you do for sand distribution. Your chart will look about like this:



We can assume that only the lightest casting is the correct weight. My, my—some of them are 20 pounds too heavy. Did you get paid for that 20 pounds? If you sell on the calculated correct weight, you are stuck for an average of 6% (or more). If you have priced on an average weight (some people weigh a pile of 1,000 or 100 castings and divide to decide the piece price weight) you are still stuck for 2% to 4% (or more).

Suppose you are running a brass shop. At 44¢ a pound for brass, every time you sell ten tons of castings, you may be giving away $528.00. Or suppose you run a grey iron shop at say 20 tons per day. Since iron at the spout is only worth about $100.00, you are only losing $120.00 per day.

Maybe you sell by the pound, but even that won't win any arguments because:

1. Your customer doesn't want that extra weight. He has to machine it off and that costs lots and lots of money.
2. Your competitor can move in on you with a lighter casting and underbid you, even at the same price per pound.
3. In the third place, you should sell on a piece price in the first place.

Now you have calculated the cost to you of overweight castings, add that figure to your sand costs. Now you have your correct sand cost because good sand practice can help you.

The best answer we have found is a *strong, tough, flowable fine* sand. You say there is no such thing? Oh yes there is! It is the new and startling Plasti-Bond practice. Plasti-Bond is the latest of our long list of original new products, including such "old faithfuls" as Revivo—the original synthetic sand bond—new in 1922. Balanced Revivo—the original special or blended bonding material—new in 1930. Dixie Bond—the original southern bentonite—new in 1938. Cupoline—the original gunning refractory—new in 1948. Seems funny but in 1922, synthetic sand was the "hot" new controversial subject. I'll bet some people said "It will never amount to much." *C'est la Vie.*

NORTON®
BORON CARBIDE

More Economically
with
Norbide® Pressure Blast Nozzles

THERE'S a NORBIDE Nozzle available to give you exactly the type of cleaning stream you need — from a broad stream for large areas to a pencil-thin stream for cleaning small openings. And NORBIDE Nozzles — lined with the hardest manufactured material commercially available — maintain stream contour, last longer than any other nozzle made and deliver maximum blasting efficiency at minimum cost per hour.

For full details on cost-cutting NORBIDE Nozzles, write for your free copy of Form 543.

NORTON COMPANY
43 New Bond St., Worcester 6, Mass.

NORBIDE® . . . *The Longest Nozzle Life You Can Buy*

Rx for maintaining hot metal schedules

CRYSTOLON* refractories are engineered and prescribed for more continuous furnace operations, both front and back slagging

You can maintain hot metal schedules for your casting line and avoid costly shutdowns by using Norton CRYSTOLON refractories — *engineered and prescribed* for highest efficiency in handling neutral and acid cupola slags.

For back slagging cupolas the Rx is CRYSTOLON slag hole blocks. For capping the notch and lining the slag chute in front slagging cupolas it's CRYSTOLON bricks and cement.

Wherever you use it, this top-quality silicon carbide refractory material will stand up under temperatures as high as 3050°F without softening, spalling or cracking. Its extreme density assures exceptional resistance to slag penetration and attack — and it lasts 5 to 15 times longer than ordinary fire clay.

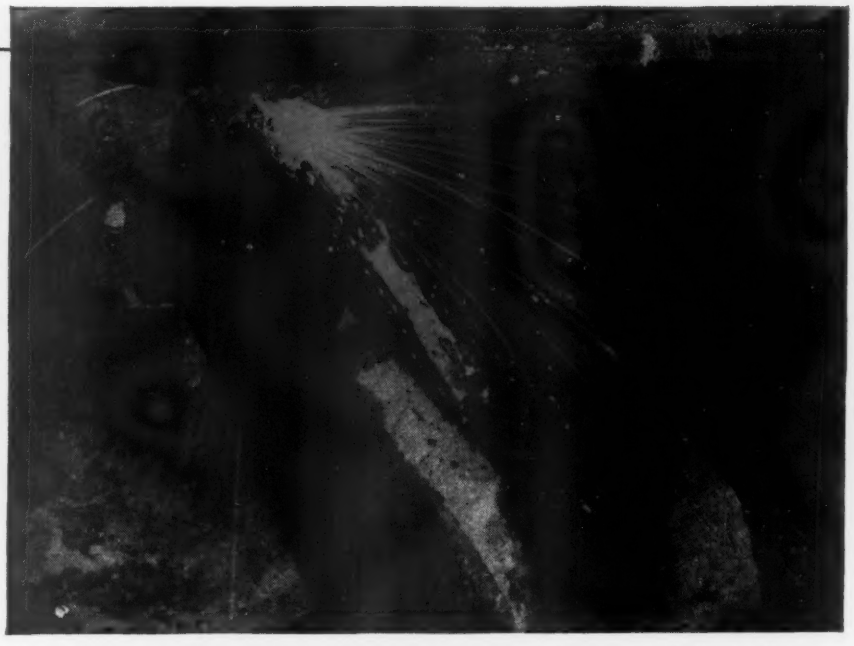
In your own foundry

these advantages mean less maintenance time and trouble for your men — and faster, more profitable metal-melting for *you*. CRYSTOLON bricks and blocks are made in sizes and shapes for every foundry requirement. See your Norton Representative for further facts. Or write to NORTON COMPANY, Refractories Division, 301 New Bond St., Worcester 6, Mass. *Canadian Representative:* A. P. Green Fire Brick Co., Ltd., Toronto, Ont.

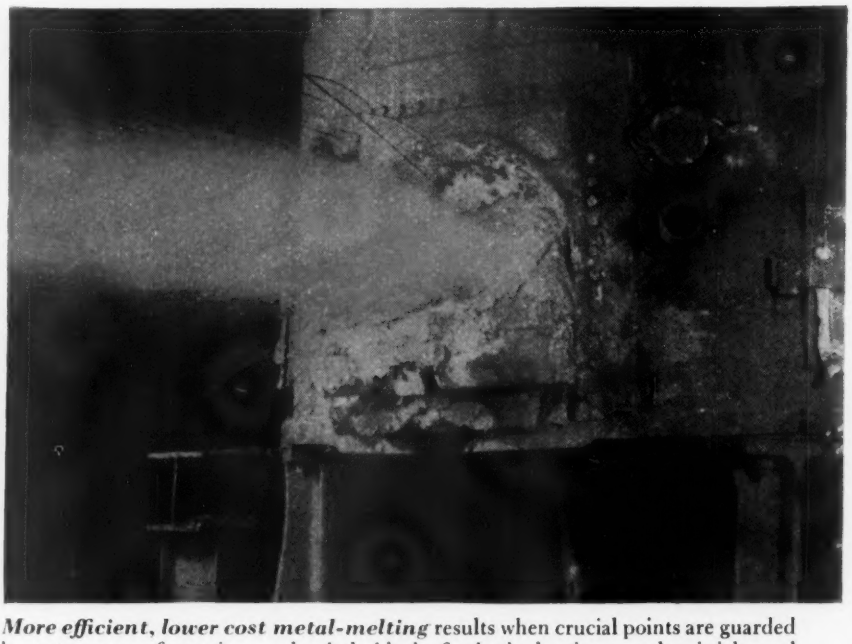
NORTON
REFRACTORIES
Engineered... Rx ... Prescribed

Making better products...
to make your products better

*Trade-Mark Reg. U.S. Pat. Off. and Foreign Countries

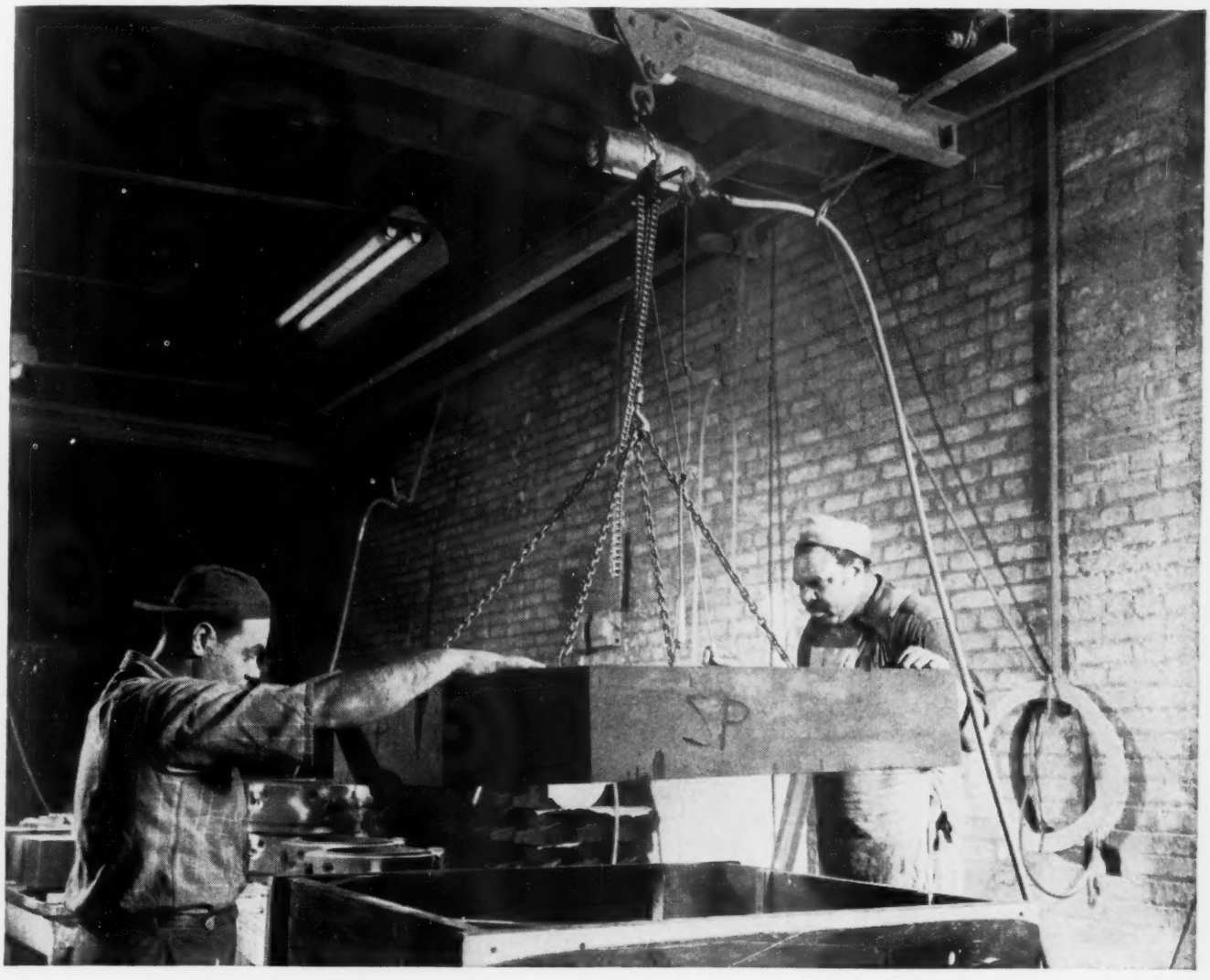


Up to 64 hours of operation without shutdown, under severest back slagging conditions, are reported by users of CRYSTOLON slag hole blocks — like this one, on heavy duty service in a big automotive parts foundry.



More efficient, lower cost metal-melting results when crucial points are guarded by CRYSTOLON refractories — slag hole blocks for back slagging cupolas, bricks and cement for front slagging cupolas.

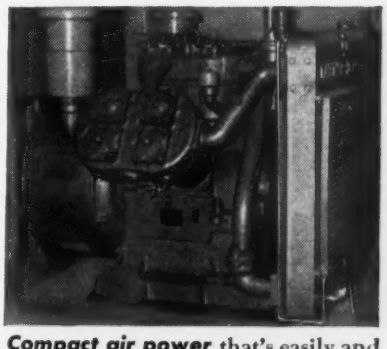
Gardner-Denver . . . Serving the World's Basic Industries



The lightweight hoist with the big, big lift

—the swift, steady lift—with gentle starts and accurate stops—the sort of a lift that's needed many times a day in any man's foundry.

This Keller Tool Air Hoist handles a half-ton load as fast as 17 feet per minute. It's a handful of power that weighs only 28 pounds. Other models, of 300-pound (weighs 28 pounds) and one-ton (weighs 78 pounds) capacities, are available. Write for details.



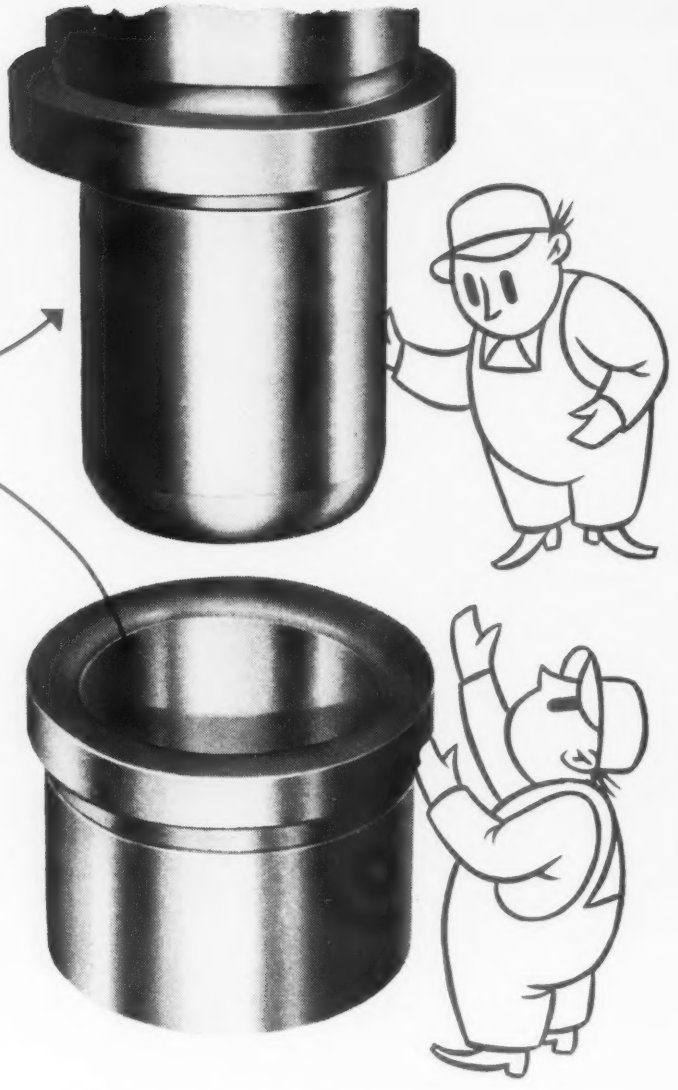
Compact air power that's easily and quickly installed—the "packaged" Gardner-Denver WB Compressor. Highly efficient. Bulletin WB-10.

GARDNER - DENVER

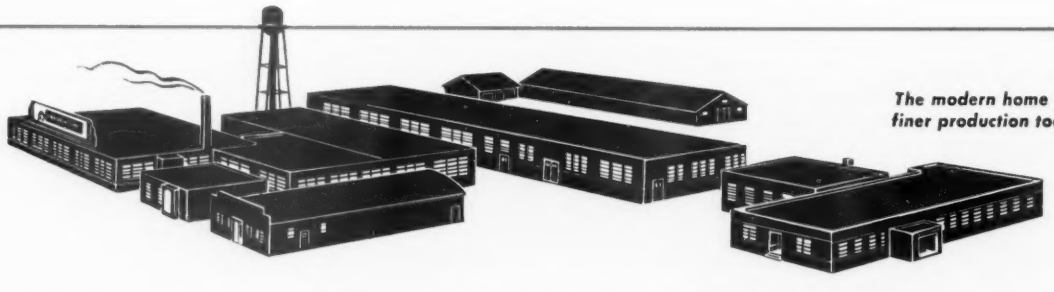
KELLER TOOL division, Grand Haven, Michigan

THE QUALITY LEADER IN COMPRESSORS, PUMPS, ROCK DRILLS AND AIR TOOLS FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

carburized and hardened steel wearing surfaces and ductile cores mean long life for UNIVERSAL flask pins and bushings



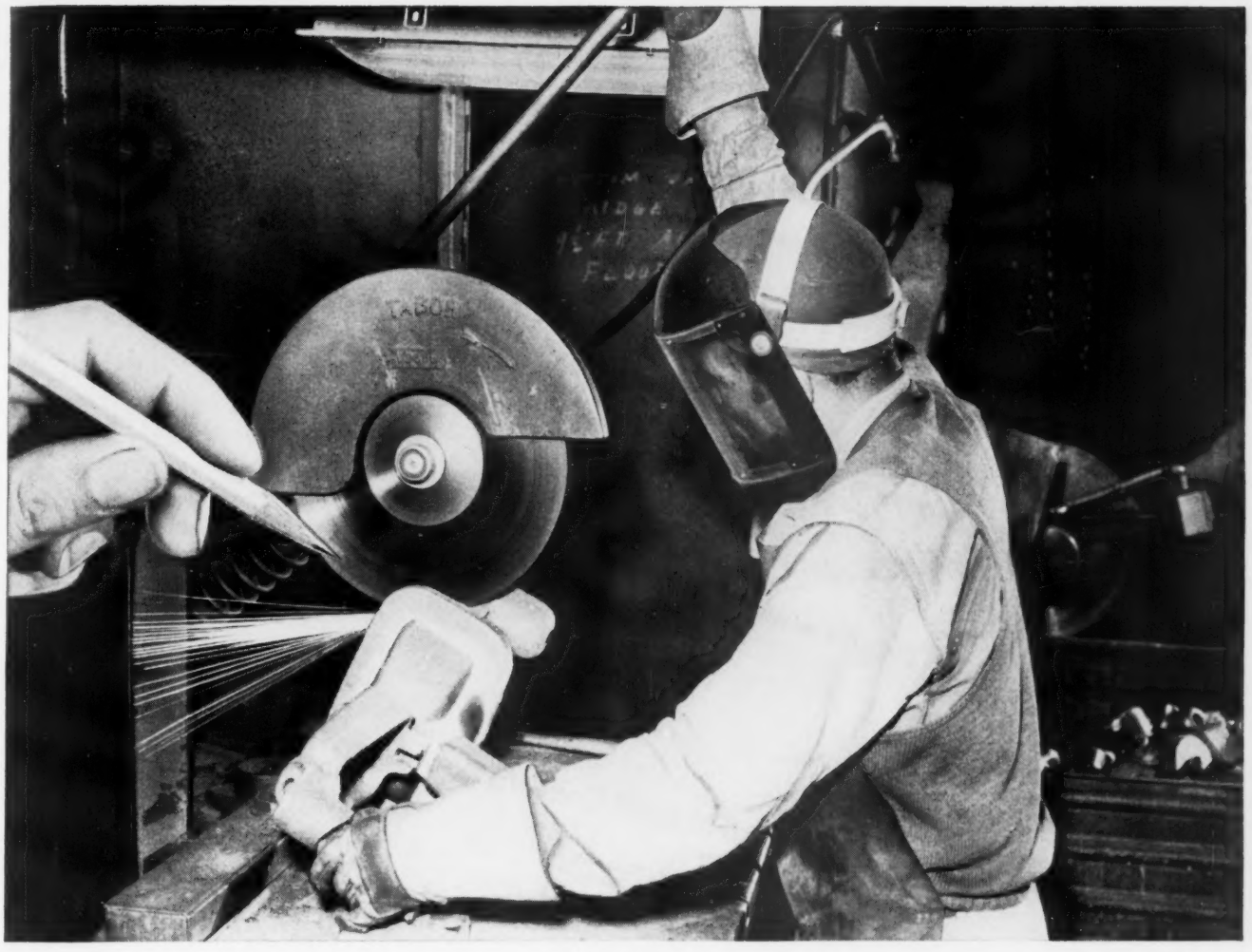
It's no easy trick to produce flask pins and bushings that are hard enough to take long, rigorous wear, and yet have cores ductile enough to resist breakage and rough treatment in the foundry. However, Universal has accomplished this difficult task. Universal flask bushings are double quenched and double drawn to produce a fine grain structure that will withstand considerable stress and strain without breaking or chipping. The wearing surfaces are carburized and hardened to reduce wear and prolong the life of both pin and bushing. Universal flask pins and bushings are precision ground to extremely close tolerances to insure instant, accurate alignment of cope and drag. Plain, taper and threaded series pins and bushings are available in a complete range of sizes as regular stock items. For complete information about Universal flask pins and bushings, write to the office nearest you — Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis. — or the home office.



The modern home of finer production tools

172

UNIVERSAL ENGINEERING COMPANY FRANKENMUTH 4, MICHIGAN



This MANHATTAN Cut-Off Wheel is Reinforced for Safer, Faster Foundry Cutting

Only with correct *built-in* reinforcement can a cut-off wheel take the abuse and excessive strain of heavy cutting in foundry operations. Manhattan Reinforced Cut-Off Wheels are reinforced two ways. First, the use of special fibers in the bond increases by 50% the strength of the wheel to withstand destruction by centrifugal force. In addition, special super-strength synthetics fabric lateral reinforcement gives Manhattan Reinforced Cut-Off Wheels resistance to side strain far beyond the ability of conventional cut-off wheels.

Actual field reports indicate up to 25% increase in cutting efficiency and cleaning-room production with these wheels . . . on both stationary and swing-frame cut-off machines. They give a degree of protection against breakage and other operational hazards which virtually eliminates cut-off wheel failures. Ask your Manhattan representative to show you how to get safer, faster cutting and increased production . . . "More Use per Dollar" . . . with Manhattan Reinforced Foundry Cut-Off Wheels and other types of high speed, heavy duty wheels.

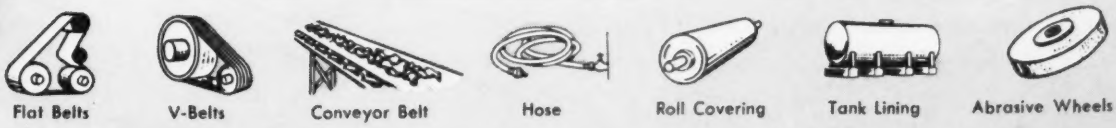
RM 639

GRINDING WHEEL INSTITUTE MEMBER

WRITE TO ABRASIVE WHEEL DEPARTMENT

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

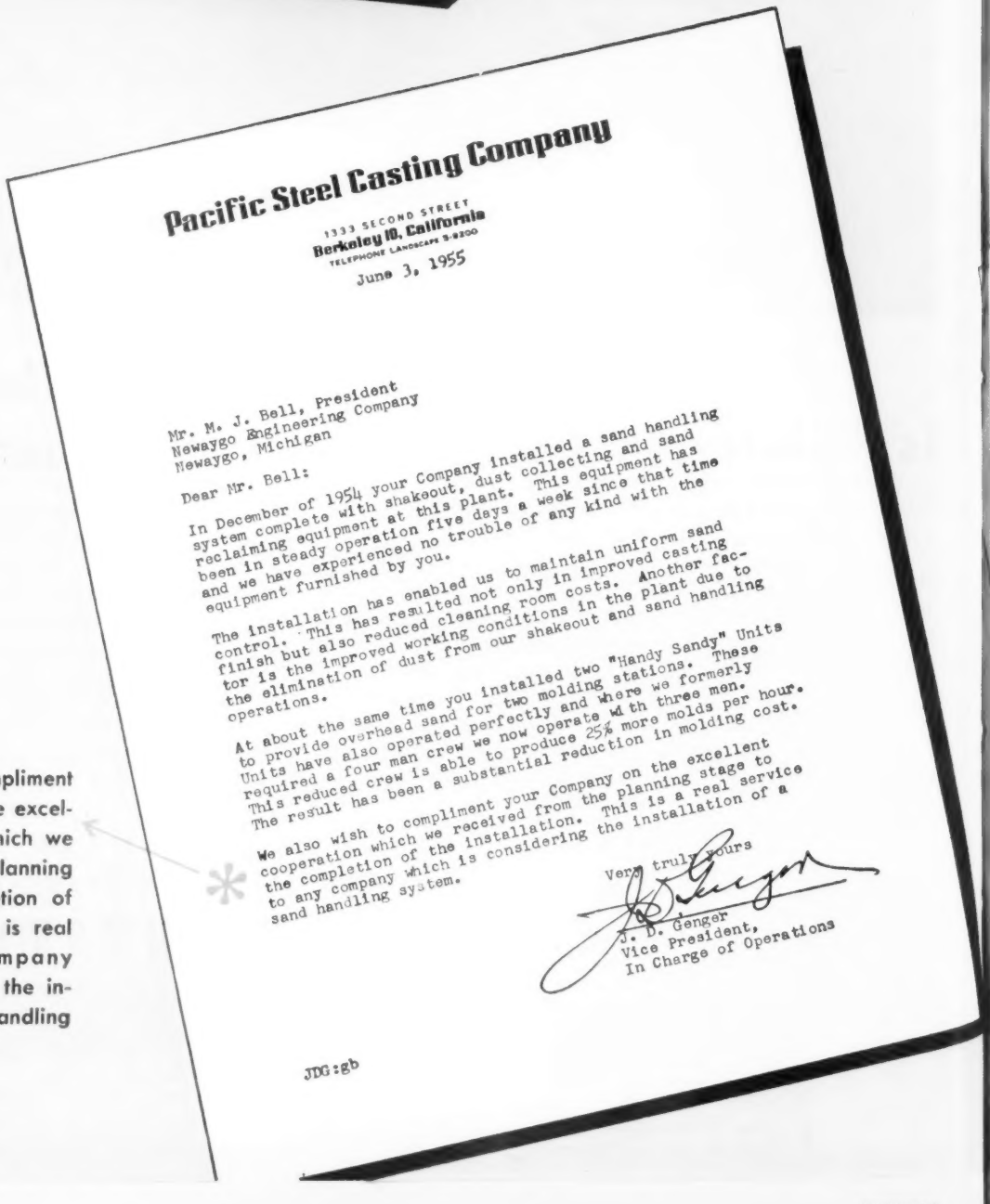


Flat Belts | V-Belts | Conveyor Belt | Hose | Roll Covering | Tank Lining | Abrasive Wheels

Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings • Asbestos Textiles • Packings • Engineered Plastic, and Sintered Metal Products • Laundry Pads and Covers • Bowling Balls

HOW IMPORTANT IS RELIABLE

HERE'S HOW USERS OF NEWAYGO sand handling systems FEEL ABOUT IT!



Pacific Steel Casting Company

1333 SECOND STREET
Berkeley 10, California
TELEPHONE LANDSCAPE 5-9200

June 3, 1955

Mr. M. J. Bell, President
Newaygo Engineering Company
Newaygo, Michigan

Dear Mr. Bell:

In December of 1954 your Company installed a sand handling system complete with shakeout, dust collecting and sand reclaiming equipment at this plant. This equipment has been in steady operation five days a week since that time and we have experienced no trouble of any kind with the equipment furnished by you.

The installation has enabled us to maintain uniform sand control. This has resulted not only in improved casting finish but also reduced cleaning room costs. Another factor is the improved working conditions in the plant due to the elimination of dust from our shakeout and sand handling operations.

At about the same time you installed two "Handy Sandy" Units to provide overhead sand for two molding stations. These Units have also operated perfectly and where we formerly required a four man crew we now operate with three men. This reduced crew is able to produce 25% more molds per hour. The result has been a substantial reduction in molding cost.

We also wish to compliment your Company on the excellent cooperation which we received from the planning stage to the completion of the installation. This is a real service to any company which is considering the installation of a sand handling system.

Very truly yours

J. D. Genger
Vice President,
In Charge of Operations

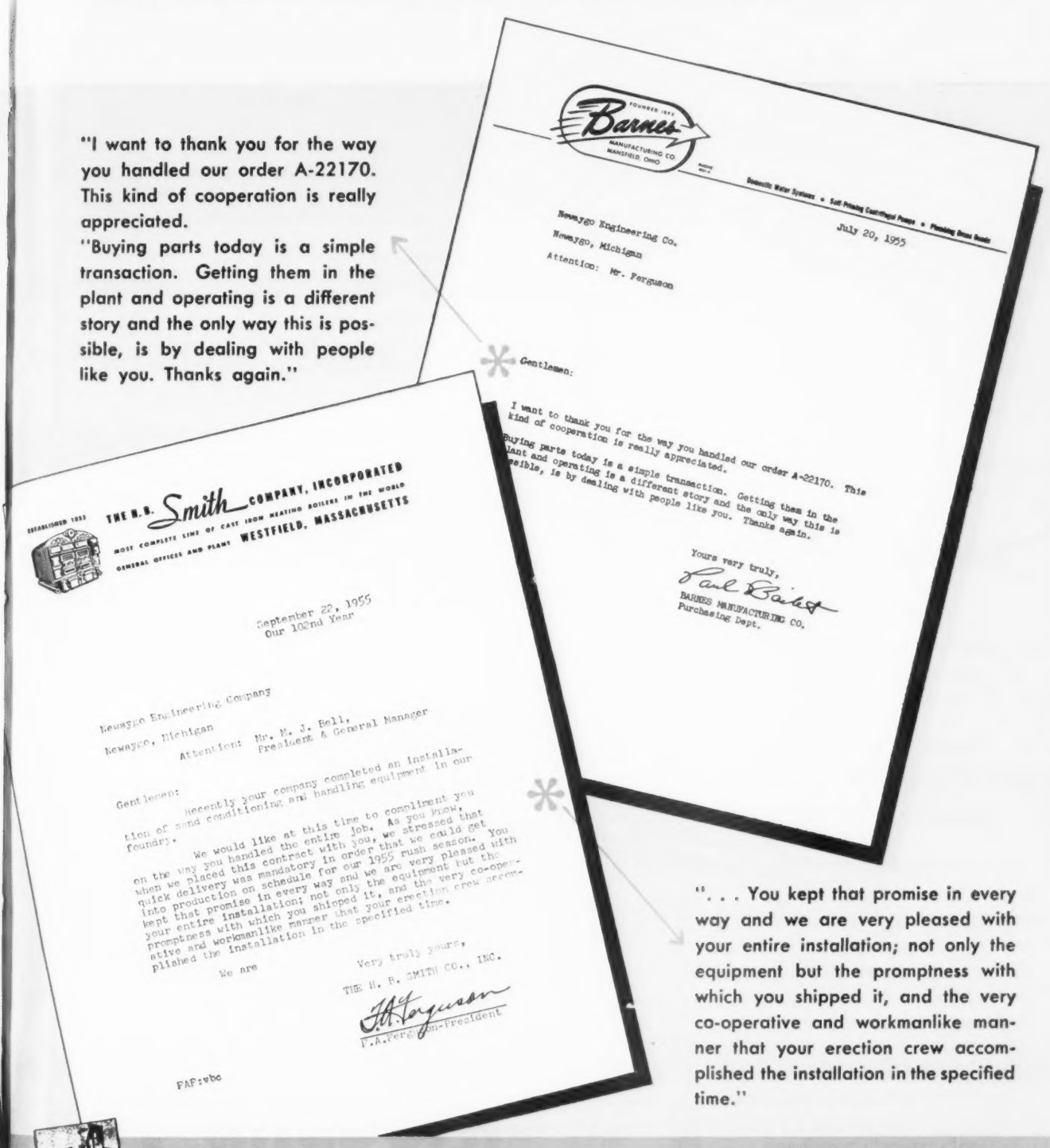
JDG:gb

"We also wish to compliment your Company on the excellent cooperation which we received from the planning stage to the completion of the installation. This is real service to any company which is considering the installation of a sand handling system."

SERVICE TO YOUR FOUNDRY?

From planning to installation . . . $50,000 to $600,000 jobs . . . these foundries found Newaygo Service as reliable as Newaygo Equipment for efficient, low-cost sand handling . . .

"I want to thank you for the way you handled our order A-22170. This kind of cooperation is really appreciated.
"Buying parts today is a simple transaction. Getting them in the plant and operating is a different story and the only way this is possible, is by dealing with people like you. Thanks again."



Barnes MANUFACTURING CO. MANSFIELD, OHIO

Domestic Water Systems • Self Priming Centrifugal Pumps • Plumbing Brass Goods

July 20, 1955

Newaygo Engineering Co.
Newaygo, Michigan
Attention: Mr. Ferguson

Gentlemen:

I want to thank you for the way you handled our order A-22170. This kind of cooperation is really appreciated.

Buying parts today is a simple transaction. Getting them in the plant and operating is a different story and the only way this is ssible, is by dealing with people like you. Thanks again.

Yours very truly,
Paul Babst
BARNES MANUFACTURING CO.
Purchasing Dept.

ESTABLISHED 1853 THE H. B. Smith COMPANY, INCORPORATED
MOST COMPLETE LINE OF CAST IRON HEATING BOILERS IN THE WORLD
GENERAL OFFICES AND PLANT WESTFIELD, MASSACHUSETTS

September 22, 1955
Our 102nd Year

Newaygo Engineering Company
Newaygo, Michigan
Attention: Mr. M. J. Bell,
President & General Manager

Gentlemen:

Recently your company completed an installation of sand conditioning and handling equipment in our foundry.

We would like at this time to compliment you on the way you handled the entire job. As you know, when we placed this contract with you, we stressed that quick delivery was mandatory in order that we could get into production on schedule for our 1955 rush season. We kept that promise in every way and we are very pleased with your entire installation; not only the equipment but the promptness with which you shipped it, and the very co-operative and workmanlike manner that your erection crew accomplished the installation in the specified time.

We are Very truly yours,
THE H. B. SMITH CO., INC.
F. A. Ferguson-President

FAF:vbc

". . . You kept that promise in every way and we are very pleased with your entire installation; not only the equipment but the promptness with which you shipped it, and the very co-operative and workmanlike manner that your erection crew accomplished the installation in the specified time."

A copy of "Planned Mechanization for Foundries" is yours for the asking. Write, wire, or phone today.

NEWAYGO | **engineering company**
NEWAYGO, MICHIGAN

Manufacturers of Neway® Mold Handling, Sand Handling and Conditioning Equipment

ELECTROMET

Trade-Mark

ALLOYS

"Quality Plus Service"

It Pays to Buy ELECTROMET Alloys Because . . .

. . . ELECTROMET maintains a complete line of highest-quality ferro-alloys and alloying metals in all commercial sizes and grades. . . . Prompt shipment of ELECTROMET ferro-alloys is assured from our 6 plants and 6 warehouses conveniently located to serve you. . . . ELECTROMET's experienced field metallurgists are always available to assist you in using ferro-alloys more efficiently.

Please contact any ELECTROMET office listed below for complete information about ELECTROMET ferro-alloys and metals.

ALLOYS FOR EVERY NEED

***Boron* . .** Ferroboron (in minimum 10.00% and 17.50% Boron grades), Manganese-Boron, Nickel-Boron and Boron Carbide.

***Calcium* . .** Calcium-Silicon, Calcium-Manganese-Silicon, and Calcium Metal.

***Chromium* . .** "Simplex" Low-Carbon Ferrochrome (as low as 0.010% maximum Carbon), Low-Carbon Ferrochrome (from 0.02% to 2.00% maximum Carbon), Nitrogen-Bearing Low-Carbon Ferrochrome, High-Carbon Ferrochrome, Exothermic Ferrochrome, Exothermic Silicon-Chrome, "EM" Ferrochrome-Silicon, "EM" Ferrosilicon-Chrome, "SM" Ferrochrome, Foundry Ferrochrome, Foundry Ferrosilicon-Chrome, Electrolytic Chromium Metal, and other Chromium Alloys.

***Columbium* . .** Ferrocolumbium and Ferrotantalum-Columbium.

***Manganese* . .** Standard Ferromanganese, Low- and Medium-Carbon Ferromanganese, Low-Iron Ferromanganese, "Mansiloy" Alloy, Electrolytic Manganese Metal, and other Manganese Alloys.

***Silicomanganese* . .** In maximum 1.50%, 2.00%, and 3.00% carbon grades.

***Silicon* . .** Ferrosilicon in all grades, including both regular and low-aluminum material, Silicon Metal, "SMZ" Alloy, Magnesium Ferrosilicon, and other Silicon Alloys.

***Titanium* . .** Low-Carbon Ferrotitanium, Silicon-Titanium, and Manganese-Nickel-Titanium.

***Tungsten* . .** Ferrotungsten, Tungsten Powder, Calcium Tungstate, and Calcium Tungstate Nuggets.

***Vanadium* . .** Ferrovanadium in all grades, Aluminum-Vanadium, Vanadium Oxide (Fused), Sodium Polyvanadate (Red Cake), and Ammonium Metavanadate.

***Zirconium* . .** 12 to 15% and 35 to 40% Zirconium Alloys, and Nickel-Zirconium.

***"EM" Briquets* . .** Silicon, Silicomanganese, Ferromanganese, Chromium, and Zirconium Briquets.

ELECTRO METALLURGICAL COMPANY

A Division of Union Carbide and Carbon Corporation

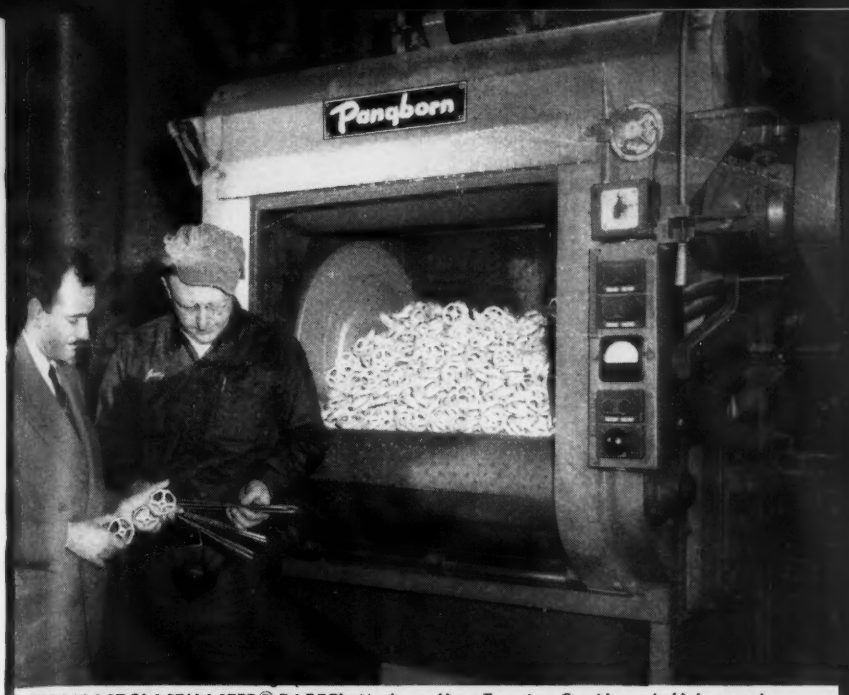
30 East 42nd Street UCC **New York 17, N. Y.**

OFFICES: Birmingham • Chicago • Cleveland • Detroit
Houston • Los Angeles • New York • Pittsburgh • San Francisco

In Canada: Electro Metallurgical Company, Division of Union Carbide Canada Limited, Welland, Ontario

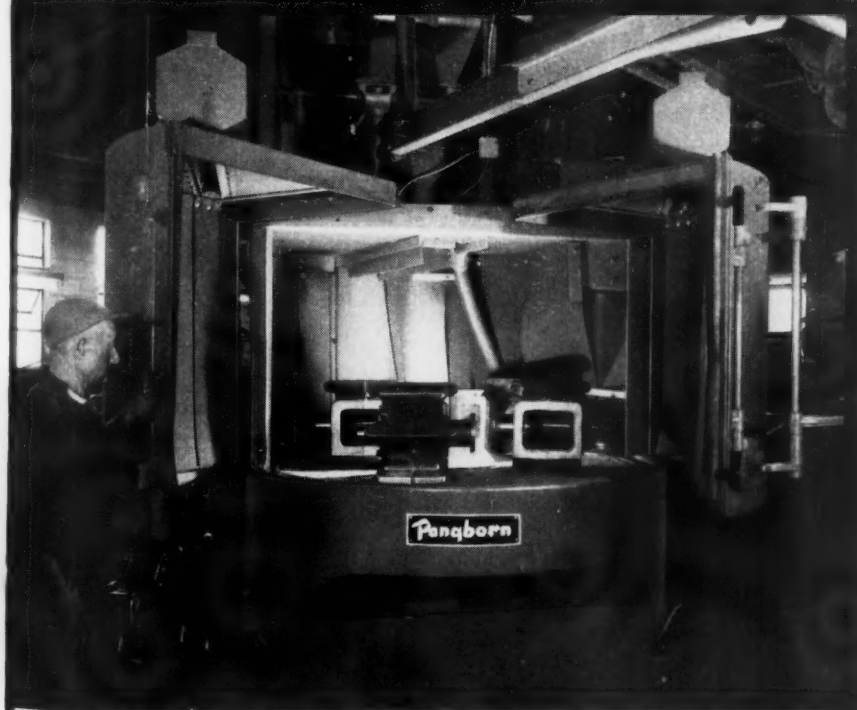
Information about these and other alloys and metals produced by ELECTROMET is contained in our catalog "ELECTROMET Ferro-Alloys and Metals." Write for a copy.

"Electromet," "EM," "Mansiloy," "Simplex," "SM," and "SMZ" are trade-marks of Union Carbide and Carbon Corporation.



ROTOBLAST BLASTMASTER® BARREL. Mathews Heat Treating Co., Newark, N.J., saved $8,000 on one contract alone by using the Pangborn Blastmaster Barrel with Rotoblast.

wherever blast cleaning



ROTOBLAST TABLE-ROOM. Utica General Jobbing Foundry, Utica, N.Y., saves $1,200 a year in labor alone with Pangborn Rotoblast Table-Room.

Pangborn

BLAST CLEANS CHEAPER

Rotoblast Blastmaster & Continuous-Flo Barrel

Rotoblast Tables & Table-Rooms

Special Blast Rooms & Cabinets

Pangborn Dust Control Equipment

Malleabrasive* Shot & Grit

Look for Pangborn Rotoblast®

Throughout the country—in small foundries and large ones, cleaning ferrous and non-ferrous pieces, handling castings, forgings, heat treated parts—Pangborn Rotoblast cuts operating costs for foundrymen. But Rotoblast offers more than versatility. This Pangborn process utilizes centrifugal force for thorough, efficient blast cleaning . . . throwing a great volume of abrasive over a large area with heavy density. It eliminates air compressor investment, saves labor costs, requires less power to operate. The result is *better* cleaning done quickly and cheaply. See how Pangborn Rotoblast can cut blast cleaning costs and save *you* money!

is done faster and cheaper

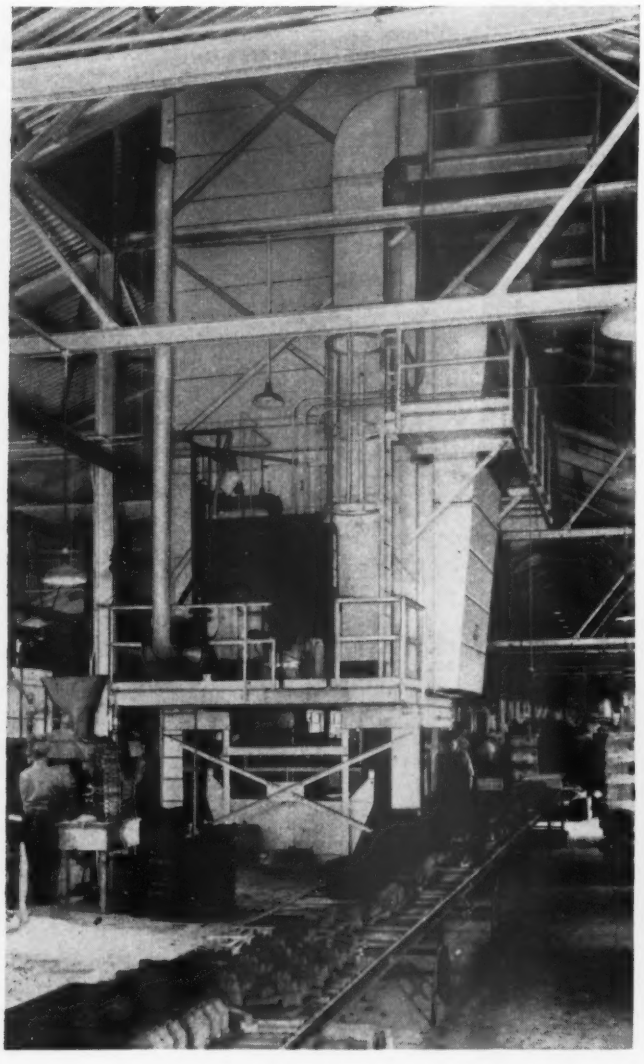
For faster, cheaper cleaning, investigate Pangborn Rotoblast now. Write today for Bulletin 227 to: PANGBORN CORPORATION, 1400 Pangborn Blvd., Hagerstown, Md.

*U. S. Patent 2184926 (other patents pending)

COLEMAN

lead to

and



Coleman Tower® Oven

Your out-dated core and mold ovens may be costing you thousands of dollars . . . because they cannot provide the production savings you can realize from modern, efficient Coleman Ovens.

The exclusive advantages of Coleman Ovens are reflected in instant improvement in cores, molds and casting quality. In many installations the immediate reduction of scrap losses . . . and substantial savings in fuel, material and labor have enabled users to pay for a new Coleman Oven in less than a year.

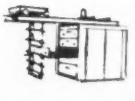
Since production savings are so vital to your profits . . . isn't it worth your time *now* to investigate the advantages of Coleman Ovens. Our experienced engineers are available without obligation to give practical suggestions for your particular requirements.

WRITE FOR BULLETIN 54

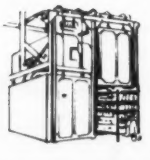
Coleman Transrack Ovens

Let us recommend the RIGHT type of core or mold oven for your requirements — we make them ALL!

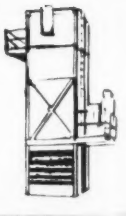
COLEMAN PORTABLE CORE OVENS



COLEMAN ROLLING DRAWER CORE OVENS



COLEMAN TRANSRACK CORE OVENS



COLEMAN TOWER CORE OVENS

OVENS

production savings

greater profits

Coleman Dielectric Oven

Only COLEMAN offers a complete line of foundry ovens with all these advantages

RECIRCULATING HEATING OR DIELECTRIC SYSTEMS to meet your requirement best.

DEPENDABLE BAKING AND DRYING. Coleman Ovens remove all uncertainties in core baking and mold drying. Rejects and make-overs are eliminated.

INCREASED LABOR SAVING. Efficient and modern mechanical designs reduce handling and other indirect labor to a minimum.

HEAVY DUTY CONSTRUCTION. Responsible for dependable performance, economical operation, and minimum maintenance cost under rugged service requirements.

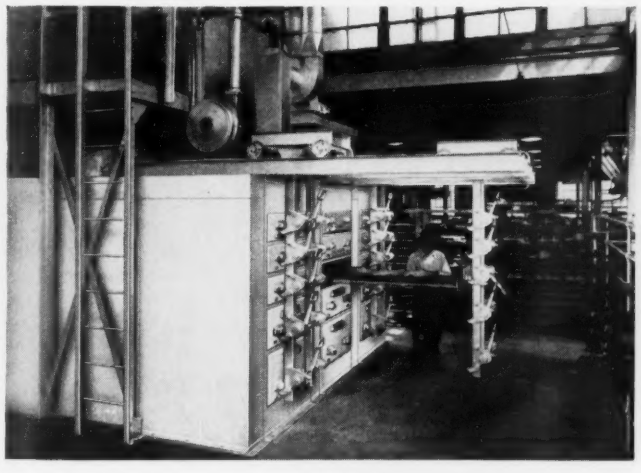
MAXIMUM FUEL ECONOMY. Coleman Heating Systems use the most economical fuel available to you — gas, oil, stoker-coal, electricity, etc.

FLEXIBILITY AND ACCURATE CONTROL to bake oil or resin binders — whichever is most satisfactory for your requirements.

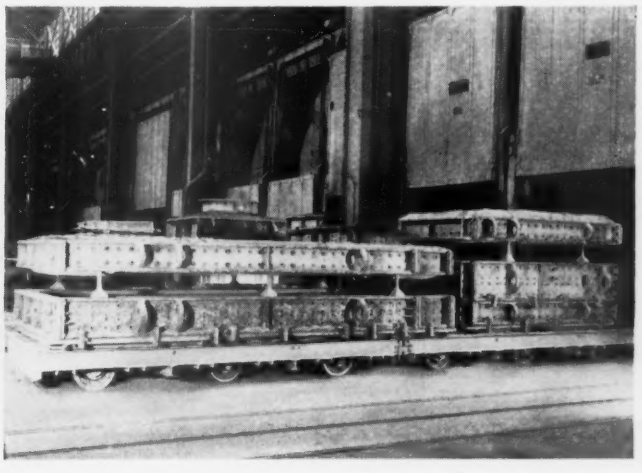
BETTER WORKING CONDITIONS. Positive ventilation built into Coleman Ovens prevents leakage of fumes and gases — helps to make the core department a good place to work.

ADVANCED OVEN "KNOW-HOW". Coleman Engineers have pioneered and developed the most efficient oven designs to meet the highly specialized needs of modern foundry methods in all classes of work.

WIDEST EXPERIENCE. Gained through more than half a century of specialization in foundry ovens and the building of over 11,000 successful Coleman Oven installations.



Coleman Rolling Drawer Ovens

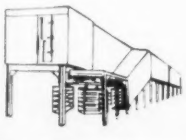


Coleman Car Type Mold Ovens

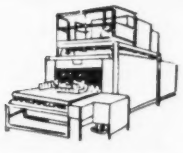
THE FOUNDRY EQUIPMENT COMPANY

1821 COLUMBUS ROAD — CLEVELAND 13, OHIO

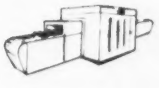
World's Oldest and Largest Foundry Oven Specialists



COLEMAN HORIZONTAL CONVEYOR CORE OVENS

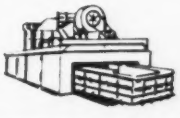


COLEMAN CONVEYOR REDRY OVENS

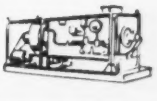


COLEMAN DIELECTRIC CORE OVENS

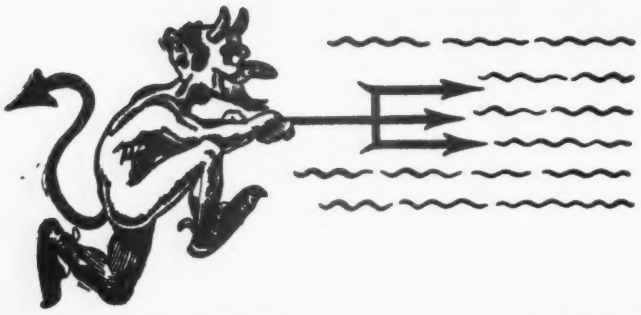
COLEMAN CAR-TYPE OVENS



COLEMAN HIGH-SPEED MOLD OVENS



COLEMAN PORTABLE MOLD DRYERS



Soffel's

FLUXES and EXOTHERMIC COMPOUNDS

for *all* Metals and Alloys

THERMOTOMIC "X" COMPOUND is an exothermic material which is molded and baked into necked down riser cores and inserts. It produces a temperature of 3500° F. and is used as ring inserts under the risers or feeding heads. Great savings are realized through reduced riser dimensions and cleaning costs. In conjunction with Thermotomic Compounds, Carbon Free Liquidizer No. 5 should be used on top of the metal in the heads.

THERMOTOMIC ABC—For aluminum and magnesium castings, necked down riser cores and inserts—prevents piping and shrinkage into castings. Soffel's ALX-31 Liquidizer should be used on top of the metals in the head.

THERMOTOMIC "HoTop" LIQUIDIZER — for short risers—saves 60 to 70% of feeding metal in the heads.

EXOTHERMIC CARBON FREE LIQUIDIZER—A feeding head compound for castings and ingots of ferrous and non-ferrous metals—saves metal and prevents piping and shrinkage.

CARBON FREE LIQUIDIZER AL-X31—For aluminum and magnesium feeding heads—prevents piping.

EXOTHERMIC INSULATING SLEEVE CORE COMPOUND—For riser sleeves—adds heat and prolongs fluidity of feeding metal in heads or risers.

DENSILTITE LADLE FLUX—For iron and semi-steel — reduces sulfur and phosphorus. Adds fluidity and temperature in pouring ladles—produces clean iron.

SOFFEL'S NON-FERROUS FLUXES

BB-2—For red brass, nickel and tin bronze pressure castings—removes sulfur, iron, phosphorus oxides and gas from brass and bronze.

SUPER BRASS FLUX—For brass and bronze—prevents oxidation of zinc.

BRASS REFINING FLUX—For cupola melting and open flame furnaces — prevents oxidation. Produces liquid slag and faster melting.

COVERALL BRASS FLUX—Removes gas and oxides from yellow brass and nickel silver.

RADIOCLARITE BRASS FLUX—For open flame furnace melting—increases fluidity, tensile strength, removes gas, oxides and iron.

AB-6 BRASS FLUX—For electric furnace melting of brass and aluminum bronze—keeps furnace linings clean.

KLEEN-ALL BRASS CLEANER—For use in bottom of pouring ladles or open flame furnaces to absorb liquid slag and keep the furnace and ladle linings clean.

BRASS ALUMINUM REMOVER — Removes all traces of aluminum from copper, brass or bronze.

HI-LED BRONZE FLUX—Holds lead up to 50% in copper without use of nickel.

NICKEL MONEL FLUX — Removes gas and adds fluidity to metal.

ALUMINUM BRONZE FLUX—A perfect deoxidizer for reducing aluminum and iron oxide in manganese bronze and aluminum bronze. Adds fluidity.

COPPERTITE FLUX—For high conductivity castings—removes cuprous and cupric oxides and gas from copper.

FERRO-OUT IRON REMOVER—Removes free iron or alloyed iron from brass, bronze or copper.

SOFFELITE ALUMINUM FLUX—Removes aluminum oxide and iron from aluminum and increases the fluidity and tensile strength.

MAGNALUM FLUX—For magnesium and aluminum alloys—removes gas and oxide and increases fluidity.

KLEN ZINC FLUX—A deoxidizer and purifier for zinc base pressure die castings—removes gas, sulfur and iron.

DIE COATING—For pressure zinc base die castings—will not scale, blister or create gas in the molds.

PERMANENT MOLD COATING—For aluminum and magnesium castings — adds longer life to molds. Produces clean gas free castings.

POT COATING—For iron pot melting — increases life of pots. Prevents iron pick up.

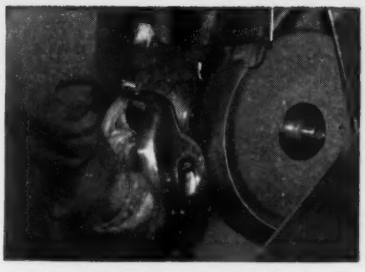
U. S. Patents No. 2,490,327 and No. 2,500,097

PITTSBURGH METALS PURIFYING COMPANY

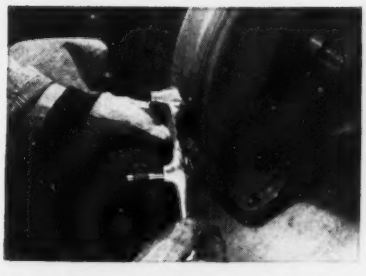
World's Largest Manufacturer of Fluxes and Purifiers For All Metals and Alloys

1352 MARVISTA ST., N. S. PITTSBURGH 12, PA.

For the newest in coated abrasives . . . watch BEHR-MANNING!



A natural for polishing intricately shaped casting surfaces.



A favorite for dry fining and blending plumbing parts.

Tops for removing flash from difficult inside contours.

Smoothing-the-way to faster, better casting finishes

BEHR-MANNING Coated Abrasive Belts, smooth cutting and long-lasting, have proven a versatile, highly productive tool in foundries all over the country. For example, grinding mold seams and flash from these aluminum pedestal bases (above) is accomplished at record breaking speeds.

Test a BEHR-MANNING Coated Abrasive Belt on your next grinding, polishing or finishing operation. A BEHR-MANNING Field Engineer will gladly demonstrate the advantages of belts, in your foundry or at a nearby BEHR-MANNING Application Room. Call him today or write Behr-Manning, Troy, N. Y., Dept. F-2.

In Canada: Behr-Manning (Canada) Ltd., Brantford.
For Export: Norton Behr-Manning Overseas Inc., New Rochelle, N. Y., U. S. A.

P-1

BEHR-MANNING® *division of NORTON Company*

▲ COATED ABRASIVES
▲ SHARPENING STONES
▲ PRESSURE-SENSITIVE TAPES

JUNIOR PUTS THE CHIEF "ON ICE"

(his goal is control!)

CHIEF KEOKUK:
"Ice slippery, but Junior more so!"

CHIEF KEOKUK JR.
"Hockey game matter of control . . . feet, hands, puck and Big Chief, too!"

PRINCESS WENATCHEE:
"Junior control 'um Chief and game. Run up heap big score."

You'll score high too when you control cost and quality with Keokuk Silvery Pig Iron . . . the superior form of silicon introduction for foundries and steel plants. Car for car, pig for pig . . . its uniformity never varies. Handle Keokuk by magnet . . . charge by weight (or count the piglets for equal accuracy). Aluminum producers score equally high with Keokuk Silicon Metal. Let us send you complete information.

When you think of SILICON think of KEOKUK!

KEOKUK ELECTRO-METALS COMPANY KEOKUK, IOWA

Wenatchee Division, Wenatchee, Washington

SALES AGENT: MILLER AND COMPANY

332 South Michigan Ave., Chicago 4, Illinois

3504 Carew Tower, Cincinnati 2, Ohio

8230 Forsyth Blvd., St. Louis 24, Missouri

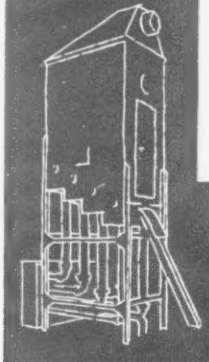
Keokuk Silvery is available in 60 and 30 lb. pigs and 12½ lb. piglets, in regular analysis or alloyed with other elements.

These six foundries are saving a total of $29,700 a month, every month, with National Sand Recovery Systems

Can You Afford *Not* to Reclaim *Your* Sand?

FOUNDRY	A	B	C	D	E	F
Cost of New Sand	$10.09/T	$7.58/T	$7.50/T	$5.50/T	$5.79/T	$7.00/T
Cost of Reclamation (-)	0.52/T	0.44/T	1.13/T*	0.49/T	0.69/T	0.67/T
Savings on Sand	$ 9.57/T	$7.14/T	$6.37/T	$5.01/T	$5.10/T	$6.33/T
Sand used per month (x)	1000/T	600/T	1000/T	600/T	600/T	720/T
$ Savings per month	$9570	$4284	$6370	$3006	$3060	$4558
Cost of installation Amortized (projected)	3-4 mo.	11-12 mo.	7-8 mo.	11-12 mo.	6-7 mo.	9-10 mo.

*User operates two units.



These figures represent actual dollar savings realized by six average foundries who are now operating the National Sand Recovery System. To them we would like to add these statements, selected at random from letters received from far sighted foundrymen who are now operating over 30 National Sand Recovery units throughout the country:

"The simplicity of operation, compactness of installation, extremely low maintenance cost, easy disposal of refuse material, and the inherent cleanliness attached to this type of unit, in our opinion, all tend to make such a unit indispensable to the modern foundry."

"We have been continually producing castings using all-reclaimed sand with results equal to that of all-new sand. Operator cost for reclaiming has been nil—under one-half of one manhour per eight hour shift."

"About half of our total new sand requirement has been replaced by reclaimed sand and the savings obtained allowed us to pay off the capital investment in ten months. We had another type sand reclaimer which was replaced by your unit."

... "It's the best buy in foundry equipment today."

Your National agent can show you the unprecedented dollar saving advantages of pneumatic reclamation *in action* . . . call him today and arrange to visit a National Sand Recovery installation in your area.

National Engineering Company
(Not Inc.)
646 Machinery Hall Bldg. • Chicago 6, Illinois

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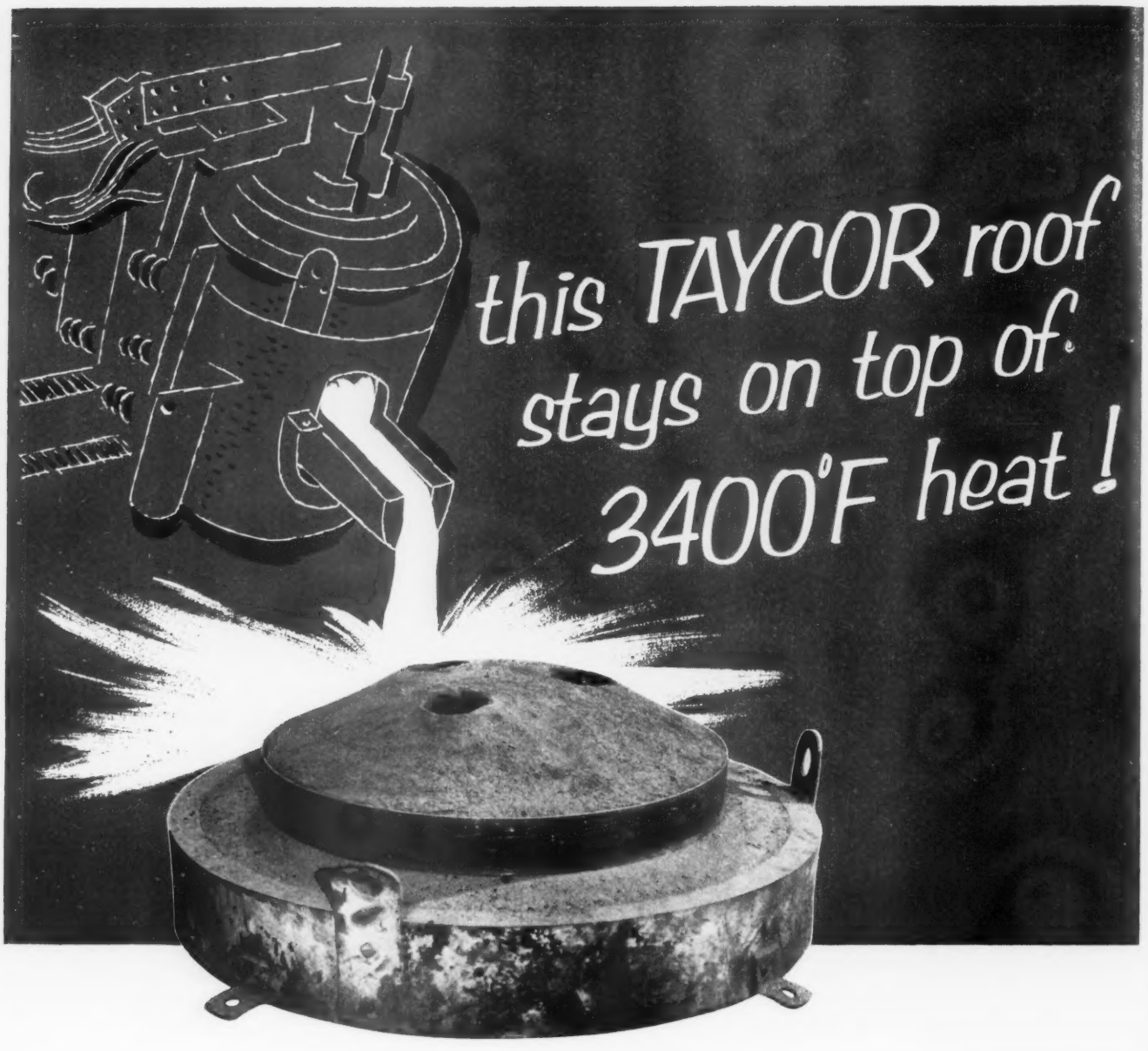


This monolithic roof of TAYCOR Ramming Mix is for a 1000-lb. basic direct arc furnace used to melt a variety of heat-resistant alloys. Furnace operates 16 hours daily at temperatures as high as 3400° F. Extensive tests have been conducted to improve roof life for this severe application. The result of these tests proved TAYCOR Ramming Mix lasted *two to three times longer* than any other refractory. TAYCOR roof life varies from a low of 200 heats to a 900-heat record high, depending upon the alloy being melted.

TAYCOR is our trade name for Corundum-base super-refractory brick, special shapes, cements, patches and ramming mixes. The outstanding properties of TAYCOR are exceptional refractoriness, high hot load strength, superior resistance to mechanical abrasion and attack from iron oxide.

These properties make TAYCOR the ideal refractory for hearths, piers, slot bottoms, front walls, skid rails of forge, heating and heat-treating furnaces . . . for small basic direct arc furnaces operated at higher-than-normal temperatures, requiring long heats . . . for linings of indirect arc furnaces . . . for rammed crucibles of high-frequency induction furnaces. Put TAYCOR to the test in your furnaces. For further information, write direct or call in a Taylor field engineer.

Exclusive Agents in Canada:
REFRACTORIES ENGINEERING AND SUPPLIES, LTD.
Hamilton and Montreal

TAYLOR ZIRCON · TAYLOR SILLIMANITE

The **CHAS. TAYLOR SONS** Co.
A SUBSIDIARY OF NATIONAL LEAD COMPANY
REG. U. S. PAT. OFF.
REFRACTORIES SINCE 1864 • CINCINNATI • OHIO • U. S. A.

Late News

CARBUILDING BOOM: Several hundred-thousand tons of castings will be required by freight car builders to fill the largest volume of business placed since World War II. Last year's orders totaled 169,872 cars, against 23,324 in 1954. The previous postwar high was 155,732 cars, ordered in 1950; the total for the ensuing four years was only 116,000.

Car builders opened this year with a backlog of 147,320 cars. A year ago unfilled orders totaled only 15,317 cars. More than one-half of 1955 orders were placed in November and December; this buying rush accounts for the jammed condition at shops of both the railroads and independent builders. About 55 per cent of the cars on order will be built at railroad shops.

CRITICAL SKILLS: Patternmaking is one of the 24 critical skills listed by the government as qualifying young men for enlistment in the armed forces' "ready reserve." This reserve requires only three to six months' active military duty instead of the normal two-year term. The list was issued by the Office of Defense Mobilization to guide selective service officials in choosing men. After the training period, the men will be reservists subject to military call for 7½ years.

SCRAP EXPORTS: Congressional hearings likely will be held on the subject of iron and steel scrap exports. Wright Patman, chairman of the House Small Business Committee, has expressed dissatisfaction with the Department of Commerce's position on scrap exports in the face of numerous consumer protests, and has indicated that formal hearings will be held by the committee shortly.

Meanwhile the domestic scrap market has lost considerable steam after average prices moved to an all-time high a week or so ago. Since then, prices have leveled off or dipped slightly in practically all districts.

NEW CHAPTER: Pittsburgh Foundrymen's Association on Jan. 16 officially became the 44th chapter of the American Foundrymen's Society. PFA had operated as an independent association since its founding in September, 1896. Its officers have been renominated to serve in similar capacities with the new chapter. H. C. Stirling, Rolls Division, Blaw-Knox Co., is president.

STEEL FOUNDRY SOLD: The steel foundry built by the government in Easton, Pa., during the war has been sold to Lehigh Inc. Built at a cost of $1,475,000, the plant was used to make mortar shells. When not engaged in ordnance production the foundry was operated on commercial work by Lehigh Inc. under lease. Special facilities for ordnance production will be kept available by Lehigh.

DIE CASTING CHANGES: Two die casting companies recently changed hands. Fort Die Casting Corp., Marysville, Mich., has been bought by a new corporate group and will be operated by the management of Centr-O-Cast & Engineering Corp. and Process Machinery Mfg. Co., Detroit. Rupert Die Casting Co., Kansas City, Kans., has been sold to the Pierce Governor Co. Pierce is considering building a new die casting plant in Louisville.

ZINC TOPS MILLION: Domestic production and consumption of slab zinc in 1955 broke all industry records. According to the American Zinc Institute, smelter production last year exceeded 1,025,000 tons. Consumption by the galvanizing industry is placed at 430,000 tons, up 8 per cent over 1954. The die casting industry, second largest user, accounted for 380,000 tons, an increase of 37 per cent.

PERSONALS: James Suttie, vice president, American Steel Foundries, Chicago, is retiring after more than 44 years with the company . . . Elmer B. Dunkak has been named to the newly created post of vice president of sales, Selas Corp. of America, Philadelphia . . . Merlin Birk has resigned as executive vice president, Waukesha Foundry Co., Waukesha, Wis. . . . Webb L. Kammerer, Midvale Mining & Mfg. Co., St. Louis, has been given a lifetime appointment to the board of directors, Washington University of St. Louis . . . Mel Conwell

has been appointed sales engineer in the midwestern territory for George Sall Metals Co., Philadelphia . . . John W. Vaughn, formerly a district manager for *Steel* magazine, has joined Alter Co., Davenport, Iowa, as assistant to the vice president, Alloy Metal Division . . . Charles O. Morris will fill the new position of assistant manager, pig iron sales, American Steel & Wire Division, U. S. Steel Corp., Cleveland . . . Charles W. McLennan is new general manager, Lynchburg Foundry Co., Lynchburg, Va., succeeding Lloyd C. McNeill, resigned.

OBITUARY: Russell J. Anderson, 60, director of manufacturing, Belle City Malleable Iron Co. and Racine Steel Castings Co., Racine, Wis., died Jan. 20 . . . Herman W. Nelson, 79, founder of the company which bore his name until it merged with the American Air Filter Co. in 1950, died Jan. 11 . . . Drew F. Farr, secretary and office manager, E. J. Scudder Foundry & Machine Co., Trenton, N. J., died Jan. 9.

MAGNESIUM PRICE UP: Price of magnesium AZ91B alloy die casting ingot has been raised 1½ cents a pound by Dow Chemical Co., Midland, Mich. The price now is 31 cents a pound in all states except California, Washington, Oregon, Montana, Idaho, Nevada, Utah and Arizona. In those areas the price is 32½ cents. The new figures are base prices applicable to orders of 10,000 lb or more. Transportation allowances will be continued.

MISCELLANY: Armour Research Foundation, Illinois Institute of Technology, Chicago, is planning a $5 million construction program involving three new buildings and additions to two others . . . Air Reduction Sales Co. will spend $16 million this year in expanding its facilities for industrial gas production . . . Plant of Arthur Harris & Co., Chicago brass foundry, suffered $50,000 damage by fire Jan. 18 . . . Free world nickel production in 1955 set a new record at 213,000 tons, an increase of about 20,000 tons over 1954 output . . . Central Foundry Division, General Motors Corp. will construct a new two-story building at its Defiance, O., plant to house an enlarged medical department and a new chemical laboratory, and will expand its locker and shower rooms by 25 per cent.

Prices of Foundry Metals and Coke

(As of January 27, 1956)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE	
Connellsville	$16.00-17.00
OVEN	
Birmingham	$25.65
Buffalo	27.50
Chicago	27.00
Detroit	27.50
Erie, Pa.	27.50
Indianapolis	26.75
Kearny, N. J.	26.75
Lone Star, Tex.	19.50
Milwaukee	27.50
Montreal, Que.	27.25
Neville Island (Pittsburgh)	26.25
New England, deld.	28.55
Painesville, O.	27.50
Philadelphia	26.50
St. Paul	26.50
Swedeland, Pa.	26.50
Terre Haute, Ind.	26.75

PIG IRON

(Per gross ton f.o.b. furnace)

	No. 2 Foundry	Malleable
Bethlehem, Pa.	$61.00	$61.50
Birmingham	55.00	....
Buffalo	59.00	59.50
Chicago	59.00	59.00
Cleveland	59.00	59.00
Duluth	59.00	59.00
Erie, Pa.	59.00	59.00
Everett, Mass.	65.00	63.00
Fontana, Calif.	62.50	....
Geneva, Utah	59.00	....
Granite City, Ill.	60.90	61.40
Lone Star, Tex	55.00	....
Neville Island (Pittsburgh)	59.00	59.00
Steelton, Pa.	61.00	61.50
Swedeland, Pa.	61.00	61.50
Toledo, O.	59.00	59.00
Troy, N. Y.	61.00	61.50
Youngstown, O.	....	59.00

NONFERROUS INGOT

(Cents per pound, carlots)

BRASS AND BRONZE: Red brass, No. 115, 42.00; tin bronze, No. 225, 56.00; No. 245, 48.75; high-leaded tin bronze, No. 305, 45.75; No. 1 yellow, No. 405, 33.25; manganese bronze, No. 421, 37.75.

ALUMINUM: 99 per cent plus primary ingots 24.40. Secondary No. 12 alloy 31.00-31.25. Deoxidizing grades: No. 1, 31.00-32.25; No. 4 29.00-29.75.

MAGNESIUM: 99.8 per cent notched ingots 33.25, f.o.b. Freeport, Tex. (10,000 lb or more).

COPPER: Electrolytic 43.00 delivered Connecticut valley.

ZINC: High grade 14.85 delivered. Die casting alloy No. 3, 18.00 delivered.

IRON AND STEEL SCRAP

(Consumer prices per gross ton delivered, except as otherwise noted)

	No. 1 Heavy Melting Steel	No. 1 Cupola Cast	Heavy Breakable Cast	Clean Auto Cast	Machinery Cast	Malleable	Short Steel Rails
Birmingham	$45.00-46.00	**$47.50-48.00	.....	.....	.....	.....	$64.00-65.00
Boston*	**46.00-46.50	**47.00-47.50	.....	.....	**49.00-49.50	.....	.....
Buffalo	47.00-48.00	**48.00-49.00	.....	.....	**52.00-53.00	.....	60.00-61.00
Chicago	48.00-50.00	49.00-50.00	.....	54.00-55.00	54.00-55.00	62.00-63.00	67.00-69.00
Cincinnati*	**46.00-47.00	**46.00-47.00	**44.00-45.00	.....	**56.00-57.00	.....	**67.00-68.00
Cleveland	51.50-52.50	56.00-57.00	47.00-48.00	54.00-55.00	56.00-57.00	59.00-60.00	71.00-73.00
Detroit*	**49.00	**43.00	**35.00	**46.00	.....	**42.00	.....
Los Angeles	42.00	**48.00	.....	.....	.....	.....	.....
New York*	49.00-50.00	47.00-48.00	46.00-47.00	.....	.....	.....	.....
Philadelphia	55.00	52.00-53.00	54.00	.....	57.00-58.00	68.00	.....
Pittsburgh	50.00-51.00	48.00-49.00	45.00-46.00	.....	54.00-55.00	.....	68.00-70.00
St. Louis*	40.50	47.00	39.00	48.00	.....	.....	66.00
San Francisco	44.00	50.00	36.00	50.00	50.00	.....	.....
Seattle	48.00	**50.00	**40.00	**40.00	.....	.....	.....

*Brokers' buying prices. **F.o.b. shipping point

DO YOU USE NATURALLY BONDED SAND?

Here's a Short Cut to —

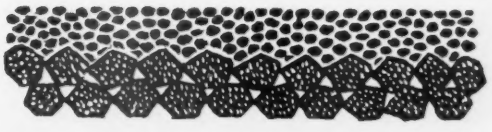
- SMOOTHER
- CLEANER
- LESS COSTLY

METAL CASTINGS

WITH IMPROVED

FACEAMOL SHAKE-ON

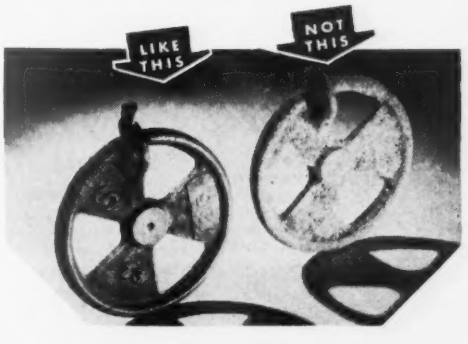
(JUST SHAKE IT ON)



IMPROVED FACEAMOL SHAKE-ON is a non-graphitic compound, having a strong affinity for mold moisture. It secures itself firmly to the mold walls — flowing metal cannot dislodge the FACEAMOL, thus cannot erode the molding sand beneath.

COMBINING *mold atmosphere control* with its spheroidal carbon base (completely silica free), IMPROVED FACEAMOL SHAKE-ON produces smoother casting surfaces, induces partial peeling action on cope and vertical surfaces, improves metal flow, eliminates "chill," modifies cooling rate, and promotes finer graphitic structure. A reducing atmosphere is created in the mold cavity by the volatile hydrocarbon from the IMPROVED FACEAMOL, using the oxygen present in the mold to form free carbon.

1. **Easily, quickly applied in one simple operation. Needs no brushing, no slicking, no hand rub-in.**
2. **Eliminates cutting, rat-tailing, scabbing, and washing.**
3. **Acts as a skin-drying agent, improves casting peel.**
4. **Prolongs fluidity of metal through non-chilling action, reduces misrun castings, and increases their machinability appreciably.**
5. **Produces clean castings, cuts sand blasting and tumbling operations approximately 50%.**



Manufacturers of:
Faceamol Spray-On, Hygeia Seacoal, Hygeia Pitch, Blended Core Compounds
PLANTS: Irwin and West Elizabeth, Pa.

PENN-RILLTON COMPANY

324 West 23rd Street, New York 11, N. Y.

Join these Foundrymen at work . . .

This symbol assures you the most for your casting dollar

You know these men. Come in and take your chair beside them. They are all Gray Iron foundry management men who face the same problems you face. Together you can learn new ideas on ways to solve foundry management problems, including cost reduction.

Together, you will discuss foundry methods, administration, markets, labor problems, costs, mechanization . . . in fact, any foundry operating topic that's important.

You *know* these men. They are friendly competitors. They operate foundries in your section of the country. They meet in your area as members of a Gray Iron Founders' Society Management Group. Their purpose is to improve the position of Gray Iron in the market by more efficient foundry operation and management, and through a free exchange of ideas. They invite you to join them.

Write for complete details about the Management Group nearest you. Gray Iron Founders' Society, Inc., National City-East 6th Bldg., Cleveland 14, Ohio.

GRAY IRON FOUNDERS' SOCIETY

with THIEM Mold Lite S...

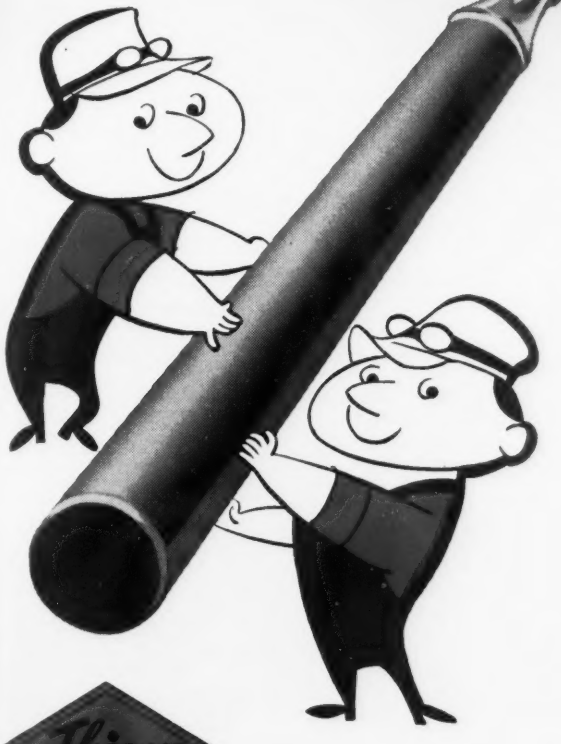
Clean and Smooth

at the Shakeout!

unretouched photograph

A 16,000 pound steel casting at Riverside Foundry, Bettendorf, Iowa, as it appeared after the shakeout.

THIEM men working with Riverside foundrymen on green sand facing, sprayed with MOLD LITE S and torch dried — performed this operation completely without interruption of production.



THIEM Mold Lite S is THE ANSWER to reducing mold drying time and increasing flask turnover. The firm coating it provides will not wet back — eliminates surface sand defects and reduces cleaning time just as it has on the 16,000 pound steel casting shown here, and cast at the Riverside Foundry, Bettendorf, Iowa.

Grey iron foundries realize the same big benefits in THIEM Mold Lite G — and, where the higher refactory value of zircon is required, your foundry can use THIEM Mold Lite Z.

Call in your THIEM representative — he's a foundry man. There is a solution to every core and mold coating and core oil problem in a THIEM product — all laboratory controlled and tailor-made for you!

THIEM DISTRIBUTORS

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Kramer Industrial Supply, Inc.	Denver, Colorado
LaGrand Industrial Supply Co.	Portland, Oregon
Manufacturers Equipment & Supply Co.	Chattanooga, Tennessee and Birmingham, Alabama
C. Eugene Silver	Houston, Texas
Springfield Facing, Inc.	Harrison, New Jersey
Horace G. Stults	York, Pennsylvania
Western Foundry Sand Company	Seattle, Washington
Walter A. Zeis	Webster Groves, Missouri
Don Barnes Foundry Supplies & Equip.	Hamilton, Ontario, Canada

Thiem

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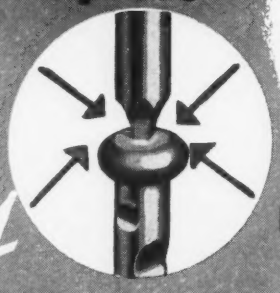
Manufacturers of foundry products exclusively — Ferro Kote • Krome Kote Dri Lite • NF-100 • No Dri G-100 • Mold Lite • Krome Kote Type Z Krome Kote NF • Core Oil • Mudding Compound • Chill Kote • Core-Hesive Core Paste

Only fine FANNER shoulder radiator chaplets

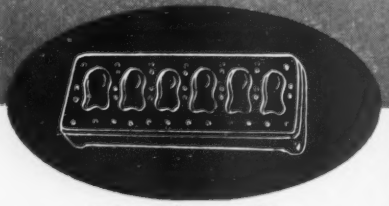
have the exclusive



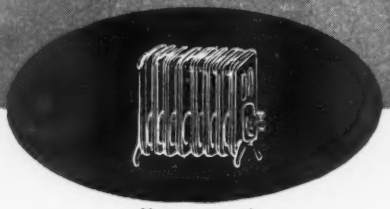
4 way break-off nick

to improve production... save money

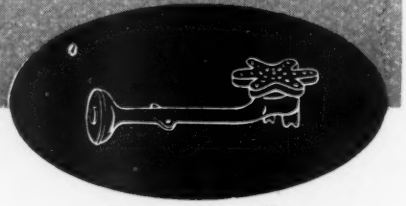
IDEALLY SUITED FOR



automotive castings



radiator castings



stove parts castings

EXCLUSIVE *New* 4-WAY BREAKOFF NICK

Provides maximum support during pouring, yet stem breaks off easily in any direction so that the few remaining after shake-out can be easily brushed off with no apparent surface marks remaining.

STAGGERED KNITTING NICKS

Provides better type of surface for knitting with molten metal, assuring thorough fusion and resulting in clean, solid castings.

STURDY SHOULDER AND SOLID RIVETED HEAD

Shoulder is designed and placed to permit chaplet to be set into pattern required distance without guesswork. Solid riveted head exactly at right angles to stem to insure that chaplet is always perfectly "true".

For better quality castings, for time and money savings in production use fine FANNER radiator chaplets. The exclusive four way break-off nick plus their other features speeds production of cleaner, sounder castings and reduces labor costs.

The development of the 4 way break-off nick is one more example of Fanner's constant study and engineering based on more than 60 years of experience in foundry practice.

Fine FANNER Radiator Chaplets are particularly suited for light pressure castings such as gas burners, radiator sections, manifolds and others. They are designed for use with the side of the greatest bearing surface against the green sand and will support approximately 5 pounds per square inch load.

Get complete information on FANNER Radiator Chaplets with the "4 way break-off nick" and other fine FANNER chaplets by writing for the FANNER Chaplet catalog today!

Qualified and specialized engineers in Fanner's Technical Service Division are available for consultation, without obligation, on problems of producing more intricate castings; developing increased strength, closer tolerances, and better quality; reducing machining and improving finish — both in ferrous and non-ferrous castings. Take advantage of the research and development work that Fanner has invested in this field to improve your profit picture! Simply direct your request to the address shown below.

THE FANNER MANUFACTURING CO.

Designers and Manufacturers of Fine Fanner Chaplets and Chills

BROOKSIDE PARK • CLEVELAND 9, OHIO

ELPAR
"Air-Rights" Series
FORK TRUCKS

Complete Line For Low Cost Handling

The extensive ELPAR "Air-Rights" series includes the exact fork truck for your requirements. Here are five reasons why: **1.** Capacities range from 2,000 to 10,000 pounds (in increments of 1,000 pounds), and larger trucks up to 80,000 pounds are also available. **2.** Electric, gas-electric, Diesel-electric or LP gas-electric power can be supplied. **3.** Models include sit-down or stand-up, center or end control. **4.** There is a wide range of lift heights for every operation—carrier loading or extra-high stacking, light or heavy-duty work. **5.** ELPAR trucks can be specially adapted or equipped with any of a score of special attachments for out-of-the-ordinary jobs.

ELPAR electric trucks give fume-free, pennies-per-day operation with minimum maintenance. As a *plus* benefit, ELPAR field engineers assist your men in proper preventive maintenance. This *free, personalized,* service adds many years of truck life.

For all the facts, write for New Condensed Catalog.

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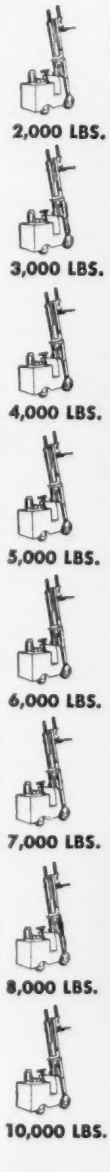
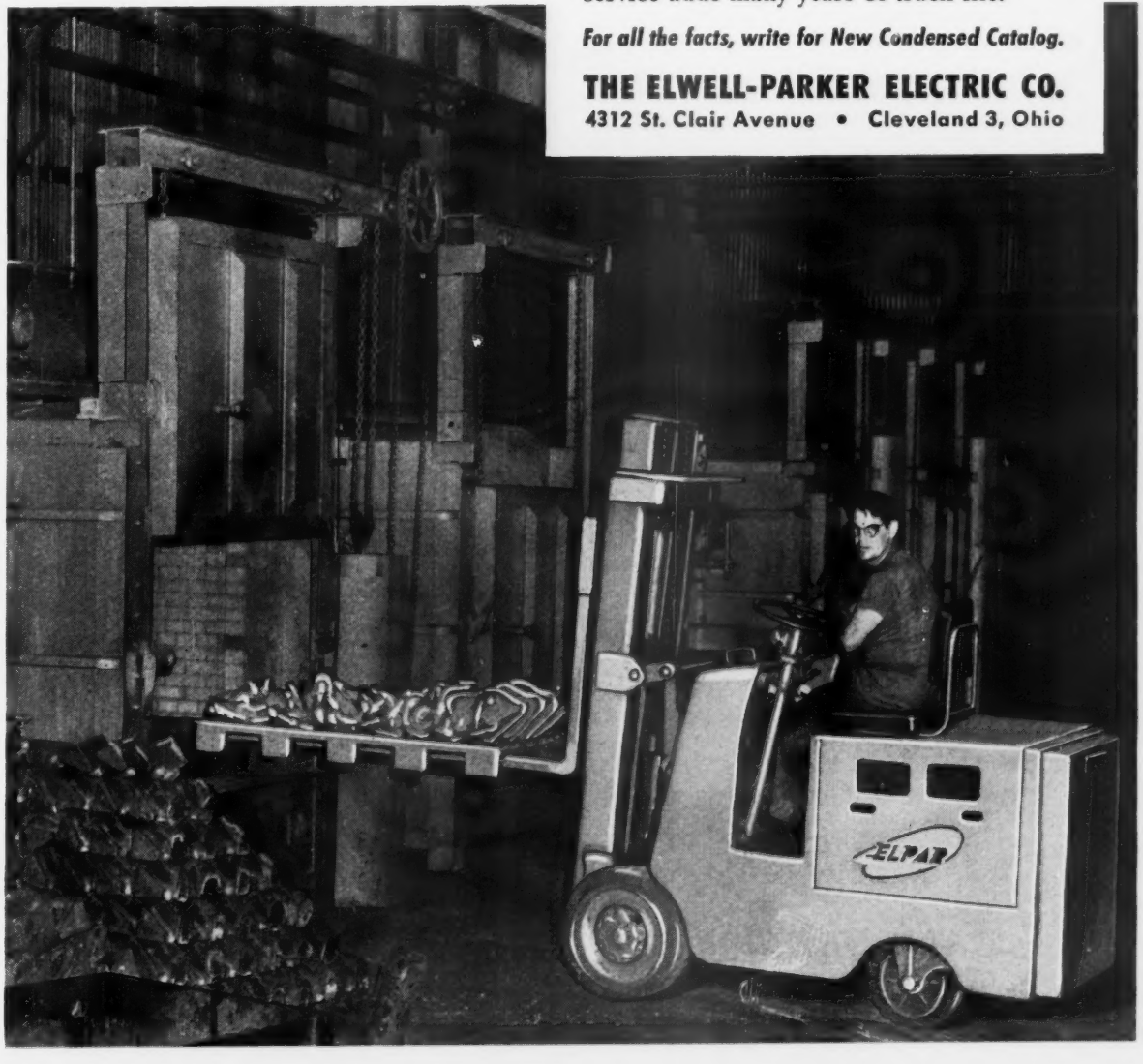
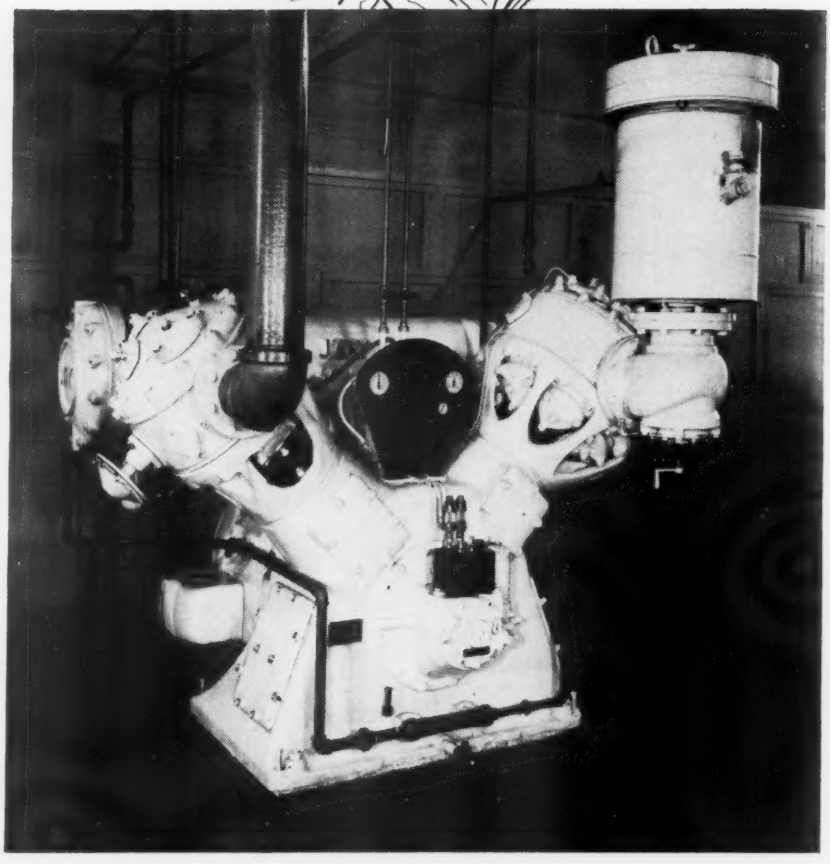






The Boss asked:

"WHAT'S SPOILING OUR SKILLED MECHANICS?"

. . . so I told him about our JOY WN-112 compressor

"To begin with, this two-stage, double-acting, water-cooled air compressor is small, light and efficient. V-vertical construction gives the machine excellent balance. The heavy-duty Joy WN-112 supplies dependable industrial air power—up to 125 psi with piston displacement from 368 to 974 CFM.

"And this compressor is *easy* to maintain. It has no large, heavy parts that need adjusting. Cylinder liners and cross-head guides are not an integral part of the frame. They can easily be replaced in a short time. Yes, that WN-112 is a breeze to maintain . . . and *that's* what is spoiling our skilled mechanics."

The WN-112 has two separate, protected, force-feed lubricating systems; one servicing the running gear, the other for the cylinders. Even the cross-head face is force-feed lubricated.

Joy "Dual-Cushion" valves have greatly prolonged life because of the variable reaction cushion which eliminates all pounding valve action. Truncated pistons, of strongly reinforced alloy, permit locating of valves on an angle. This insures smooth air flow and efficient head cooling.

All flange-mounted motors for Joy compressors are built to Joy specification. Floor space and foundation requirements, already minimized by the compressor's package design, are 50% less with the flange-mounted motor. The WN-112 is adaptable to other drives if desired.

For complete details, write ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Write for Bulletin 37-13

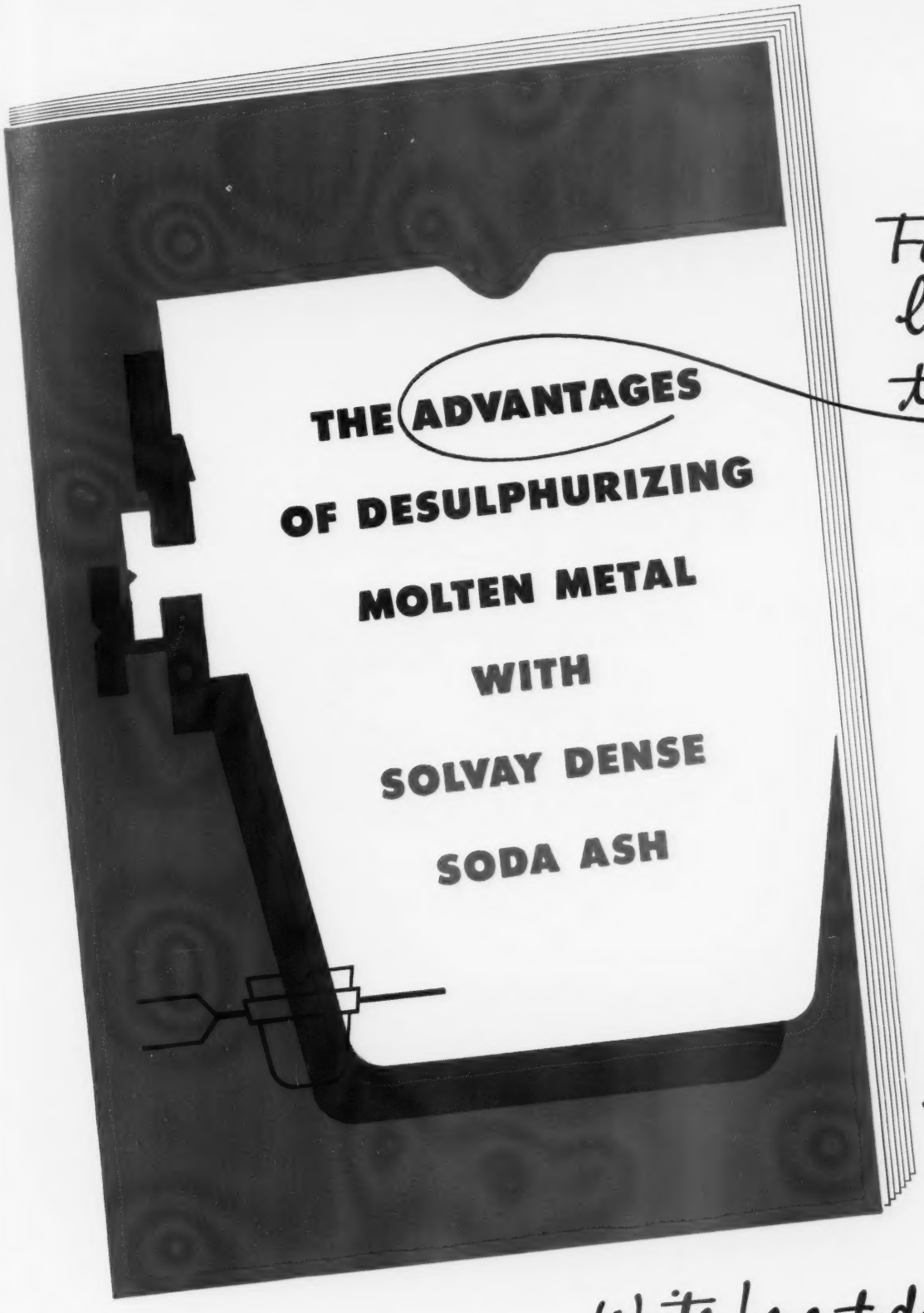
Consult a Joy Engineer

For Air and Gas Compressors, Oxygen and Nitrogen Generators, Vacuum Pumps and Boosters, Conveyors, Fans, Electrical Connectors, Hydraulic Fittings and Hose Assemblies.

WSW 15909-37

JOY

SPECIALISTS IN THE COMPRESSION AND MOVEMENT OF AIR AND GASES SINCE 1885



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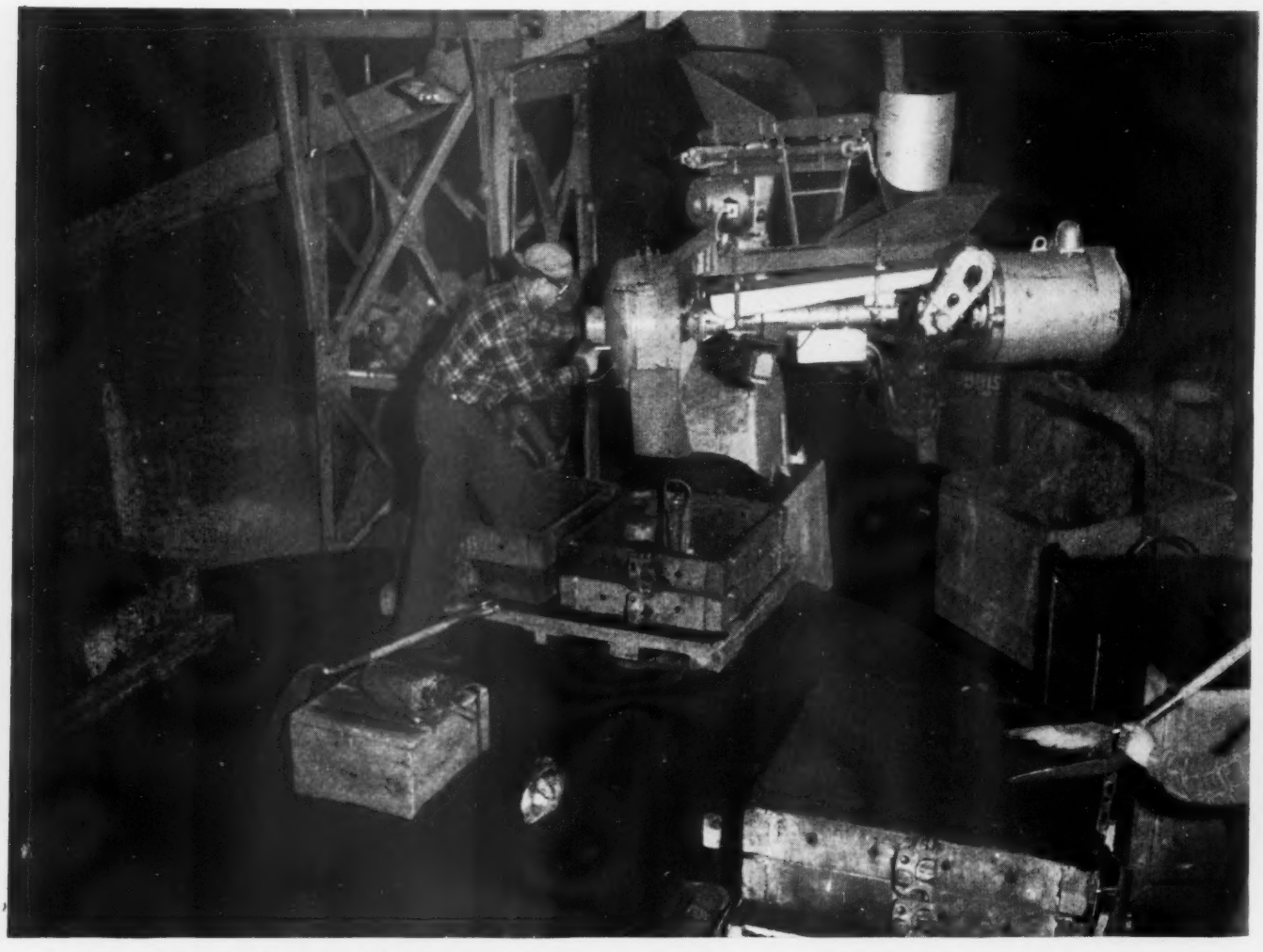
Costs cut by 20% to 50% in the mechanization of two Maritime foundries

Steel castings from Maritime Steel and Foundries, Limited of New Glasgow, Nova Scotia have been a part of almost every important project in Canada's Maritime provinces during the past thirty years. The brass and iron foundries of T. McAvity and Sons, Limited at Saint John, New Brunswick are among the largest in these same provinces. There is little similarity in these two organizations except for their progressiveness, as these two firms are among the most progressive in Canada. It's not surprising that both Maritime and McAvity have installed Sandslinger-Roto-Mold units to handle their molding, for these highly flexible units have been installed by leading foundries throughout the world. It's not surprising either that both Maritime and McAvity depend on Speedmullors to thoroughly mull all of their molding sand.

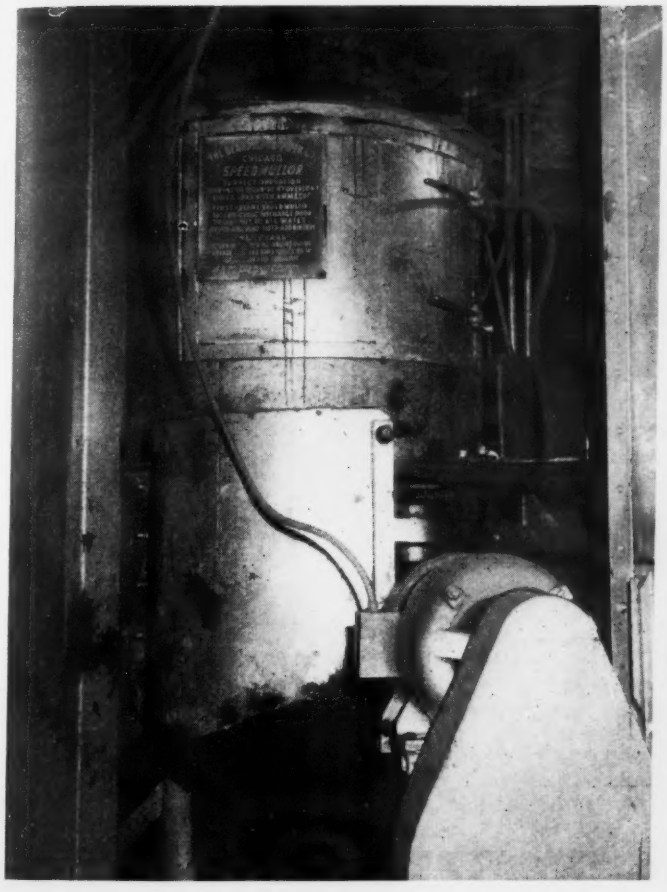
Results are typical of the benefits obtained in hundreds of other foundries using this type of equipment. At Maritime the total man-hour-per-ton rate has been reduced by more than fifty percent. A single Model "40" Speedmullor prepares all of the foundry's molding sand . . . over eighty tons daily, and a Slinger-Roto-Mold Unit handles all of the foundry's molding. A B & P Rol-A-Draw machine rolls over and draws all of the molds.

At McAvity the new molding unit handles over seventy percent of the molding with an actual molding man-hour saving of more than twenty percent. A B & P 50 Speedmullor - 40 Preparator unit prepares all of the sand for the iron foundry while a Model "30" Speedmullor prepares sand for the brass foundry.

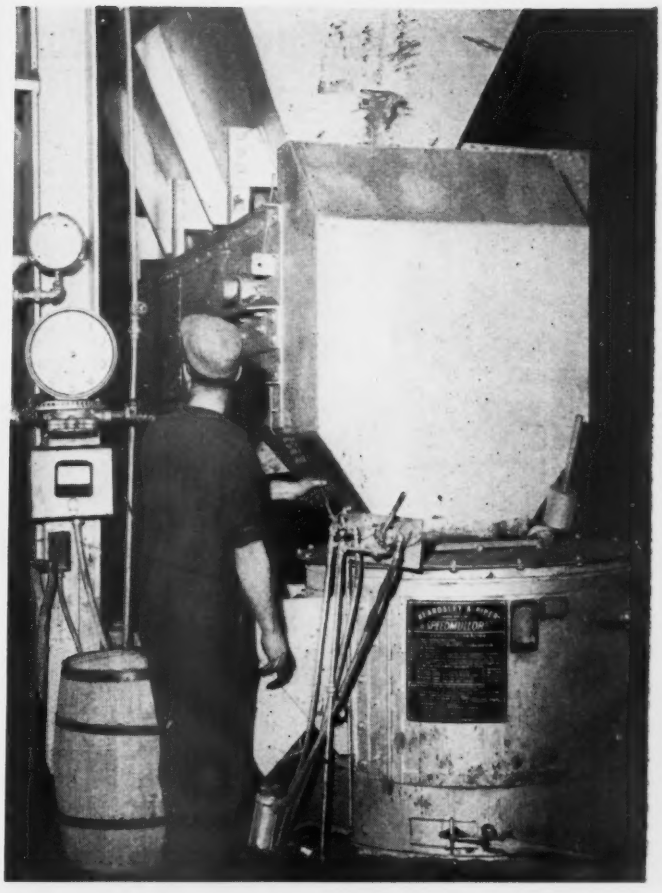


TOTAL MAN-HOUR-PER-TON SAVINGS OF OVER 50% were a result of the successful mechanization of Maritime Steel and Foundries, Limited. This Slinger Roto-Mold Unit, installed as a part of this mechanization, handles all of the foundry's molding. Both wood and metal patterns are used and many of the smaller patterns are mounted with cope and drag on the same board, as shown here.

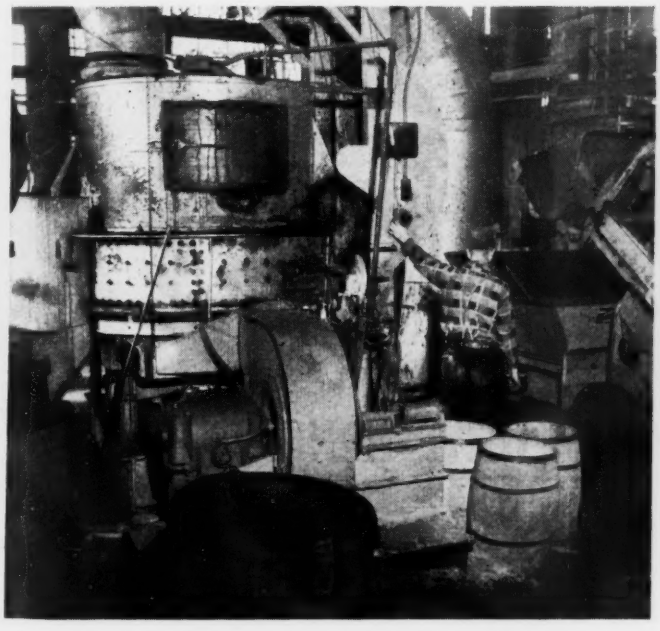
BEARDSLEY AND PIPER DIVISION PETTIBONE MULLIKEN CORPORATION
2424 NORTH CICERO AVENUE • CHICAGO 39, ILLINOIS



THIS SINGLE MODEL "40" SPEEDMULLOR prepares all of the molding sand for Maritime Steel's molding operations. A six-cubic-foot batch of closely controlled synthetic sand is prepared every one-and-a-half minutes. Since the entire plant depends on this mullor, the Speedmullor's no down-time record is important.

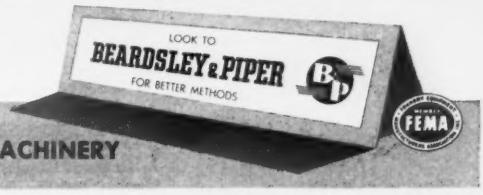


McAVITY'S BRASS FOUNDRY OPERATIONS are provided with a dependable supply of thoroughly mulled molding sand by the Model "30" Speedmullor. The sand is prepared in four-hundred-pound batches and total cycle time is ninety seconds. A green strength of 8 to 9 psi. is held uniformly from batch to batch.



A SPEEDMULLOR-PREPARATOR UNIT with Model "60" Speedmullor and Model "40" Preparator provides fully mulled and conditioned molding sand to the slinger. Sand is discharged from the Speedmullor into a B & P Roto-Feed for delivery to the slinger.

McAVITY'S SANDSLINGER-ROTO-MOLD UNIT handles both wood and metal patterns and wood and metal flask equipment. With the new unit the foundry has greater range and productivity and far greater output is obtained from the existing floor area.



THE WORLD'S LARGEST EXCLUSIVE MANUFACTURER OF FOUNDRY MACHINERY

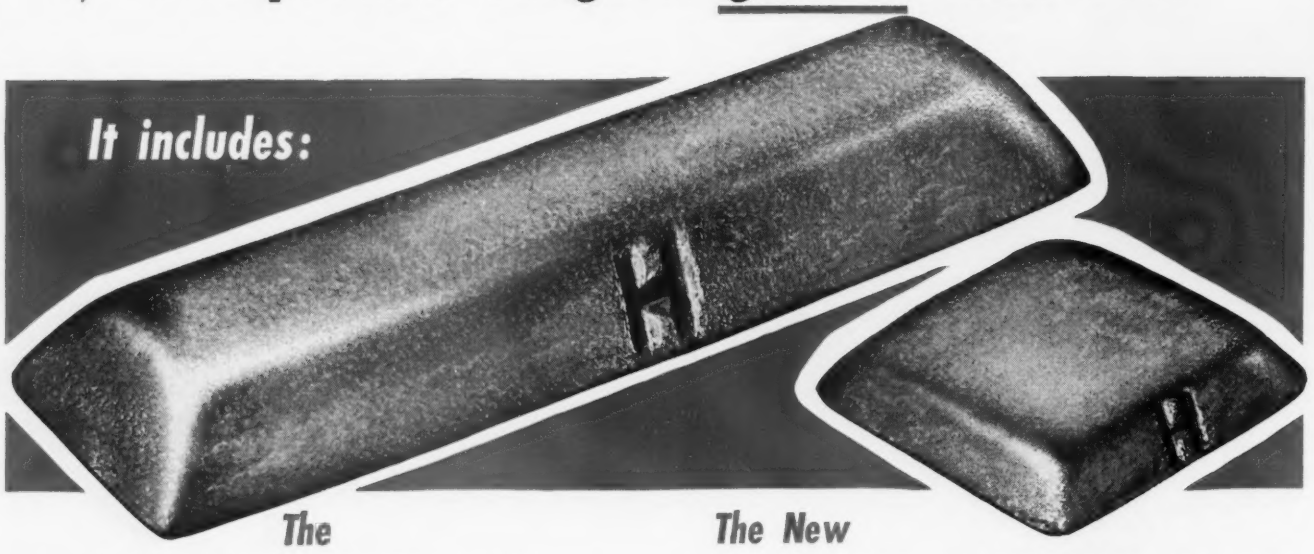
Now, more than ever, you can depend on

HANNA

as your best source for

PIG IRON

- *Our merchant capacity is bigger than ever*
- *Our plant is better than ever*
- *Our product range is greater than ever*



The

HANNA 38-POUND PIG

The foundryman's favorite standard pig. Available in all grades, silvery and HannaTite. A good example of the quality that has made Hanna "the best known name in iron."

The New

EXCLUSIVE HANNATEN INGOT

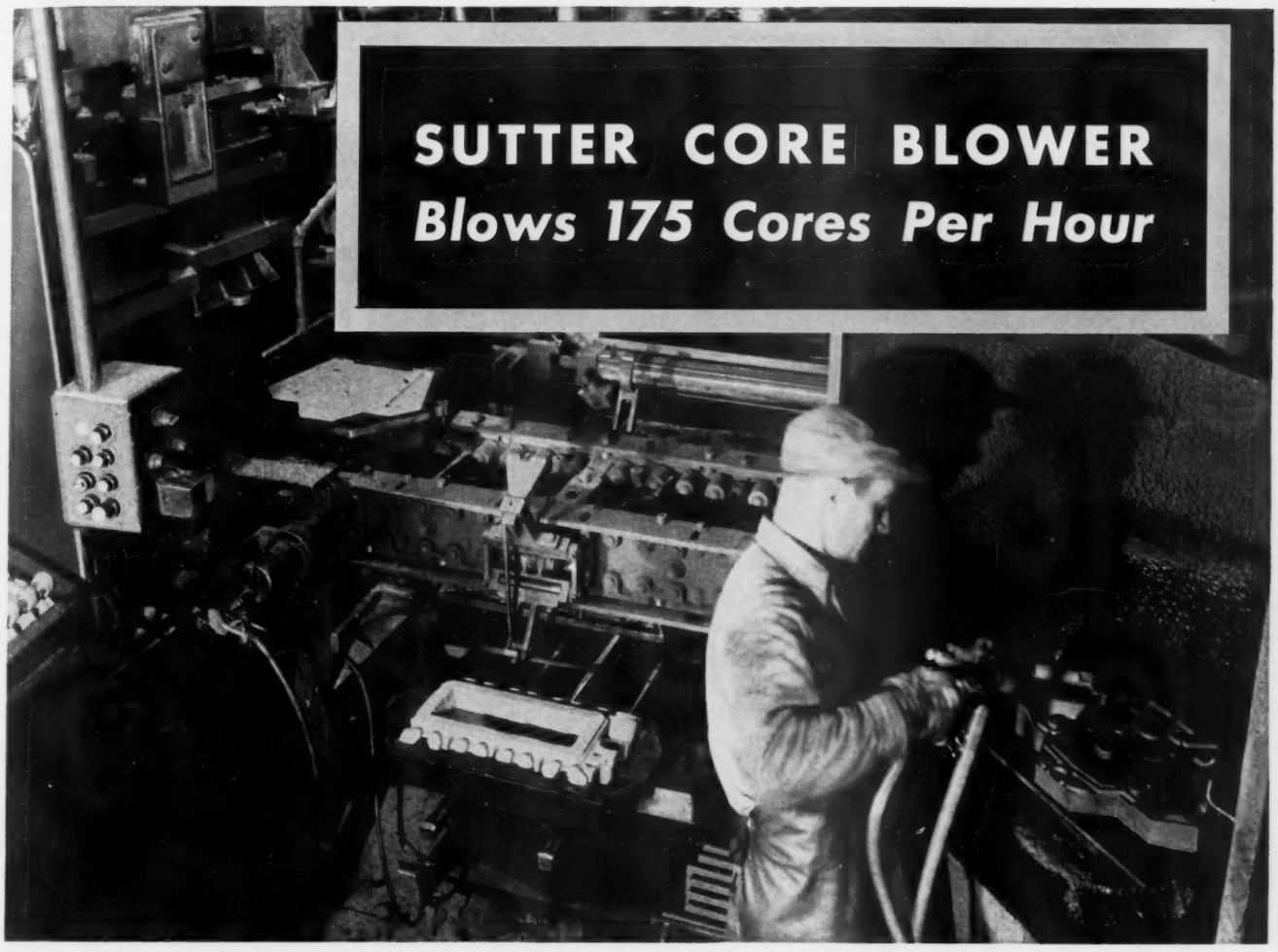
For 10-lb.-pig users, this new ingot means no free-carbon pockets, finer grain structure, more even melting. Available in all grades, silvery and HannaTite—an extra-close-grain iron.

THE HANNA FURNACE CORPORATION

Buffalo • Detroit • New York • Philadelphia

Merchant Pig Iron Division of

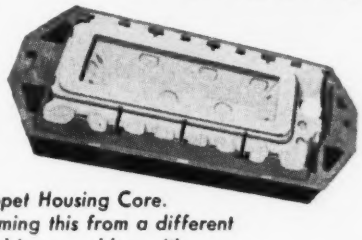
NATIONAL STEEL CORPORATION



SUTTER CORE BLOWER
Blows 175 Cores Per Hour

2 Different Cores . . . 2 Different Sands!

Gear Cover Core, shown in the action picture above, moving to rollover to be drawn automatically.



Tappet Housing Core. Forming this from a different sand is no problem with versatile Sutter equipment.

Here's real core blowing flexibility . . . the kind that can pay off *for you* in easier production scheduling and extra core output!

This Sutter Dual Head "Mechanicore" is in operation at Holmes Foundry Company, Ltd., Sarnia, Ontario. Holmes is one of Canada's leading suppliers of gray iron castings for the automotive industry. The machine blows a gear core and a tappet housing core alternately, *using a different sand for each core.* The entire cycle is automatic, requiring only unloading by the operator. This leaves him free to spray finished gear cores as shown, place them in a core rack and also set a paste-in core in the tappet housing core before placing it in a rack. Core production is 175 per hour.

The Sutter Dual Head "Mechanicore" design offers such profitable alternatives as: (1) Use both heads for the same core to increase production, (2) Maintain full production, as shown, on two different cores, (3) Use either head as a single blower to switch production quickly when needed.

Sutter builds a variety of standard model machines, also designs and builds custom units. Consult our engineers, entirely without obligation, or send for technical bulletins.

SUTTER PRODUCTS CO.

2005 WESTWOOD AVE. • DEARBORN, MICH.

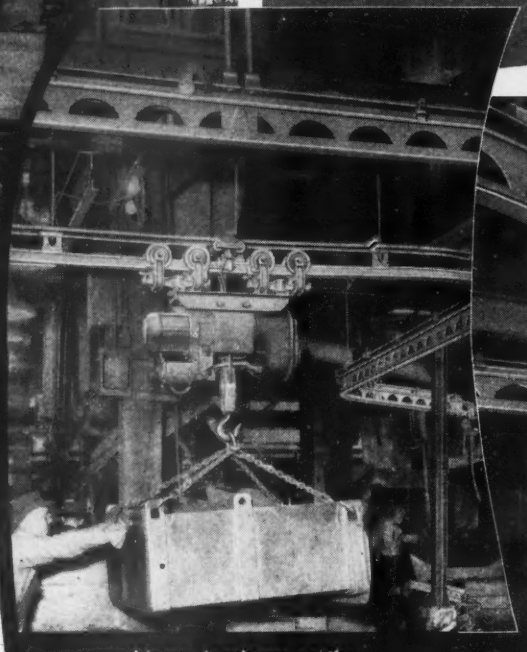
SUTTER

Canadian and Overseas Mfr. & Dist'r.

Foundry Equipment Limited — Leighton Buzzard, Bedfordshire, England

3 TIME-SAVING STEPS IN HANDLING MOLDS TO SHAKEOUT

Dumping molds into shake-out box at pouring floor in a steel foundry.



Heavy loads are easily pushed on smooth overhead rails.

Molds are quickly emptied into shakeout by tipping box with air (or electric) hoist.

The handling of molds to shakeout is one of the many jobs simplified and speeded by overhead Cleveland Tramrail equipment.

Ten or more molds, depending on size are quickly dumped into a shakeout box at pouring floor. The box is conveyed to the shakeout on smooth overhead Cleveland Tramrail cranes and trackage by an easy rolling carrier that may be either of the hand-propelled or motor-driven type. When over the shakeout, it is quickly tipped and emptied by an air or electric hoist.

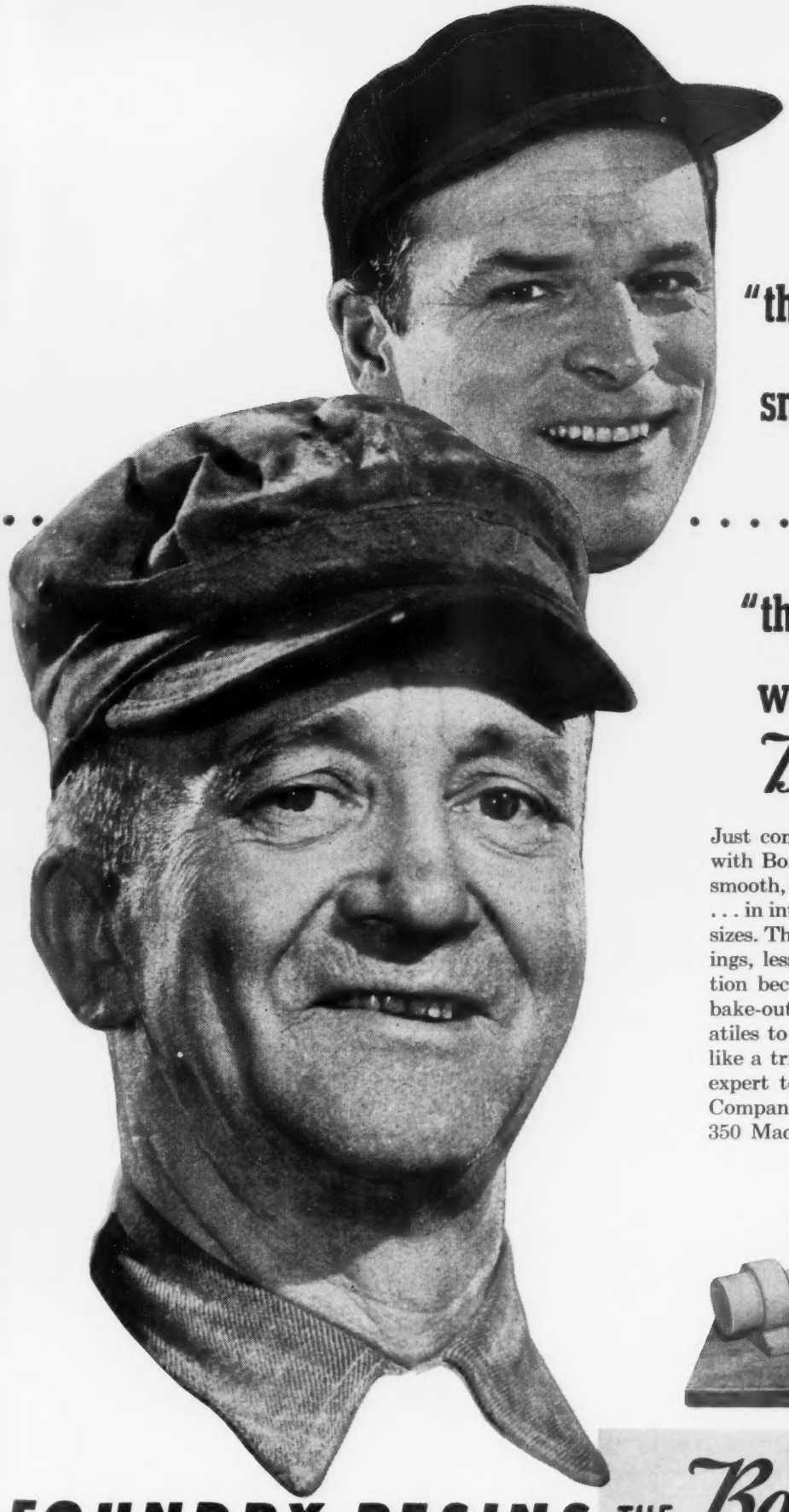
The same Cleveland Tramrail equipment also cuts costs in delivering molds to pouring floor and speeding pouring operations.

GET THIS BOOK!

BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy.

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
3802 East 286th St., Wickliffe, Ohio.

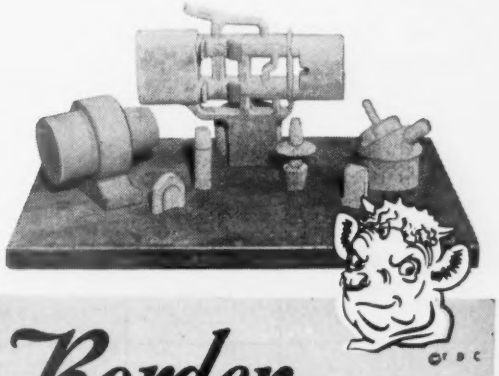
CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT



"that's what I call smooth, hard cores!"

"they all are, since we switched to *Borden* resins!"

Just combine efficient baking equipment with Borden resins and you, too, can get smooth, hard cores like those shown below . . . in intricate shapes . . . in large or small sizes. They're cores that mean better castings, less scrap. And they speed production because Borden resins assure faster bake-out, easier shake-out, contain no volatiles to gum up oven interiors. If you'd like a trial run—with a Borden technical expert to assist you—write The Borden Company, Chemical Division, Dept. F-26, 350 Madison Ave., New York 17, N. Y.



FOUNDRY RESINS THE *Borden* COMPANY
CHEMICAL DIVISION

UREA AND PHENOLIC RESIN CORE BINDERS . . . SHELL MOLD RESINS . . . CORE SPRAY . . . CORE PASTE . . . PARTING AGENTS

NEVILLE FOUNDRY COKE means *Assured Quality* From Coal to Castings

When we talk about *assured quality* in coke, we like to be specific. In the first place, Neville Foundry Coke is carefully processed from clean, washed coals which contain a high percentage of Pocahontas. This care, plus close scientific control of production, assures you of a coke that is stronger, denser and more uniform—with more fixed carbon and less ash and sulphur. In fact, we're so *sure* of the quality of Neville Coke that we *guarantee* it to meet your rigid specifications. This *quality-guarantee* is your assurance of maximum temperature at the nose of the tuyere and hotter, cleaner, more fluid iron.

As a merchant coke producer, operating four batteries of ovens, Pittsburgh backs up this guarantee of quality with a guarantee of reliable, continuing supplies . . . today and in the future. Wouldn't you like to enjoy these benefits in *your* foundry? Then specify *Neville* on your next coke order.

Typical Specifications of Neville Foundry Coke

Volatile Matter	Fixed Carbon	Ash	Sulphur
.75%	92.5%	6.50%	.58%

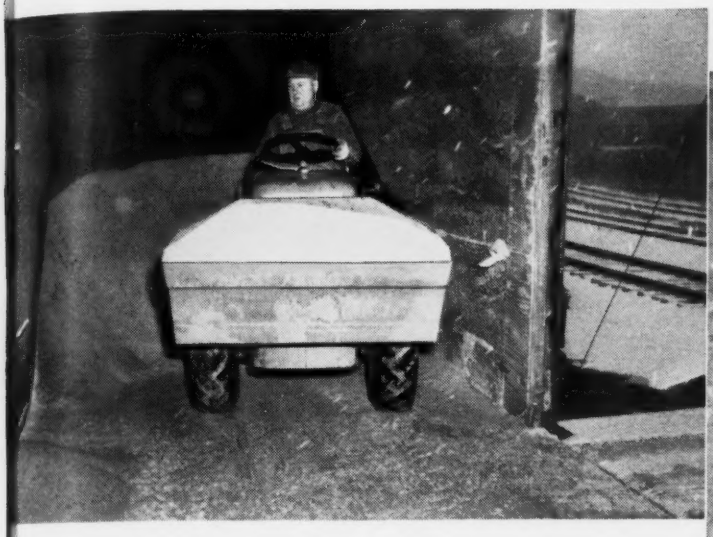
Standard ASTM Shatter on 2" screen is 95%. Porosity controlled at 48%.

WSW 5924

COAL CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

Half-Yard Loader Scoots Around in Boxcar

Compact Tractomotive TL-6 Tracto-Loader is High Producer in Confined Areas



Feeds Conveyor From Inside Boxcar

TL-6 Tracto-Loader moves bulk material from a boxcar to a conveyor set up just outside car door. This 33.7 hp loader has a full half-yard bucket, yet it can scoot around in this confined area, make right-angle turns without jockeying.

Here is a real production booster where work space is limited. The TL-6 is ideal for unloading boxcars, traveling through narrow aisles and doorways, making hairpin turns near columns and posts. Has short, 6½-ft turning radius . . . over-all length only 9 ft, 7 in., width 4 ft, 5 in.

You get big loads fast and you carry them low. Torque converter drive eliminates engine stalling . . . crowding is positive and smooth. Bucket has scooping action — tips back 22° at floor level. Reaches carry position, 50° tip-back, at only 3 ft above floor — means easier maneuvering, greater stability, better visibility.

As for ease of handling, operators say it's the best yet. Forward and reverse are controlled by a single, smooth-working lever — no gear shifting necessary. Reverse is twice as fast as forward — lets you get away from the pile "on the double."

Ask your Allis-Chalmers Construction Machinery Dealer to show you the TL-6 or the two larger Tracto-Loaders in action.

For bigger, tougher jobs, see the Tractomotive TL-10 Tracto-Loader — the industrial wheel loader that proved the soundness of Tracto-Loader design. It set new standards in loader performance with a combination of hydraulic torque converter drive and clutch-type transmission. Has 63-brake hp, 1-cu-yd Tip-Back Bucket. Various interchangeable attachments.

write for free catalog ▶

TRACTOMOTIVE

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☐ Please send new Tractor-Loader Catalog

☐ Have salesman call

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COVER GREATER SURFACE AREA

GET... *Smoother...* *Cleaner...* CASTINGS *at lower cost!*

...WITH DELTA SUPERKOAT WASH

Delta Superkoat Wash is recommended for Steel, Gray Iron, Malleable and Non-Ferrous castings. It's easy to mix and apply uniformly to green or dry sand and baked surfaces by dipping, swabbing, spraying or brushing.

Working samples and complete literature on Delta Foundry Products will be sent to you on request for test purposes in your own foundry.

NOTE THESE IMPORTANT ADVANTAGES OF DELTA SUPERKOAT WASH:

1. **NO PRECIPITATION OR SETTLING —** When thoroughly mixed, wash will stay in suspension indefinitely.
2. **EASY TO APPLY —** It can be dipped, swabbed, brushed or sprayed on green or dry sand and baked surfaces.
3. **RAPID, DEEP PENETRATION & EXCELLENT ADHESION —** Quickly anchors itself 5 to 7 grains deep in sand surfaces.
4. **NON-REACTIVE — LOW GAS —** Will not react or produce gas in contact with molten metal.
5. **REDUCED CLEANING COSTS —** Cast surfaces are smoother and castings are cleaner.
6. **WILL NOT FLAKE —** When completely dried, the wash is thoroughly bonded to the sand surfaces.
7. **HIGHLY REFRACTORY —** Has an unusually high fusion point.
8. **ELIMINATES SAND FUSION AND BURN-IN —** Flowing metal will not crack or rupture wash during pouring.
9. **ECONOMICAL TO USE —** Covers a greater surface area at a lower cost per pound of wash.

DELTA

DELTA OIL PRODUCTS CO.

MANUFACTURERS OF SCIENTIFICALLY CONTROLLED FOUNDRY PRODUCTS

MILWAUKEE 9, WISCONSIN

6,000-r.p.m. wheel speed is "stopped" by 1/10,000 sec. stroboscopic exposure. (The "see-through" safety guard was specially made for this photo only.)

Here's the perfect answer to all rough grinding problems. CARBOFLEX Depressed Center Wheels, with resilient fibre-reinforced construction, combine maximum cutting ability with maximum operator safety. Reduce or undercut heavy welds, clean up castings, rough off fins and sharp risers... in record time, at less abrasive cost per wheel. CARBOFLEX Wheels are tops for cutting-off and slotting, too! Another outstanding feature: the back of the wheel, like its face, is knurled. You can cut with either side, plus the edge... without initial dressing. Call your CARBORUNDUM Distributor or salesman today for a demonstration of this rugged production booster. For descriptive folder A-1272, write The Carborundum Company, Niagara Falls, New York. In Canada: Canadian Carborundum Co., Ltd., Niagara Falls, Ontario.

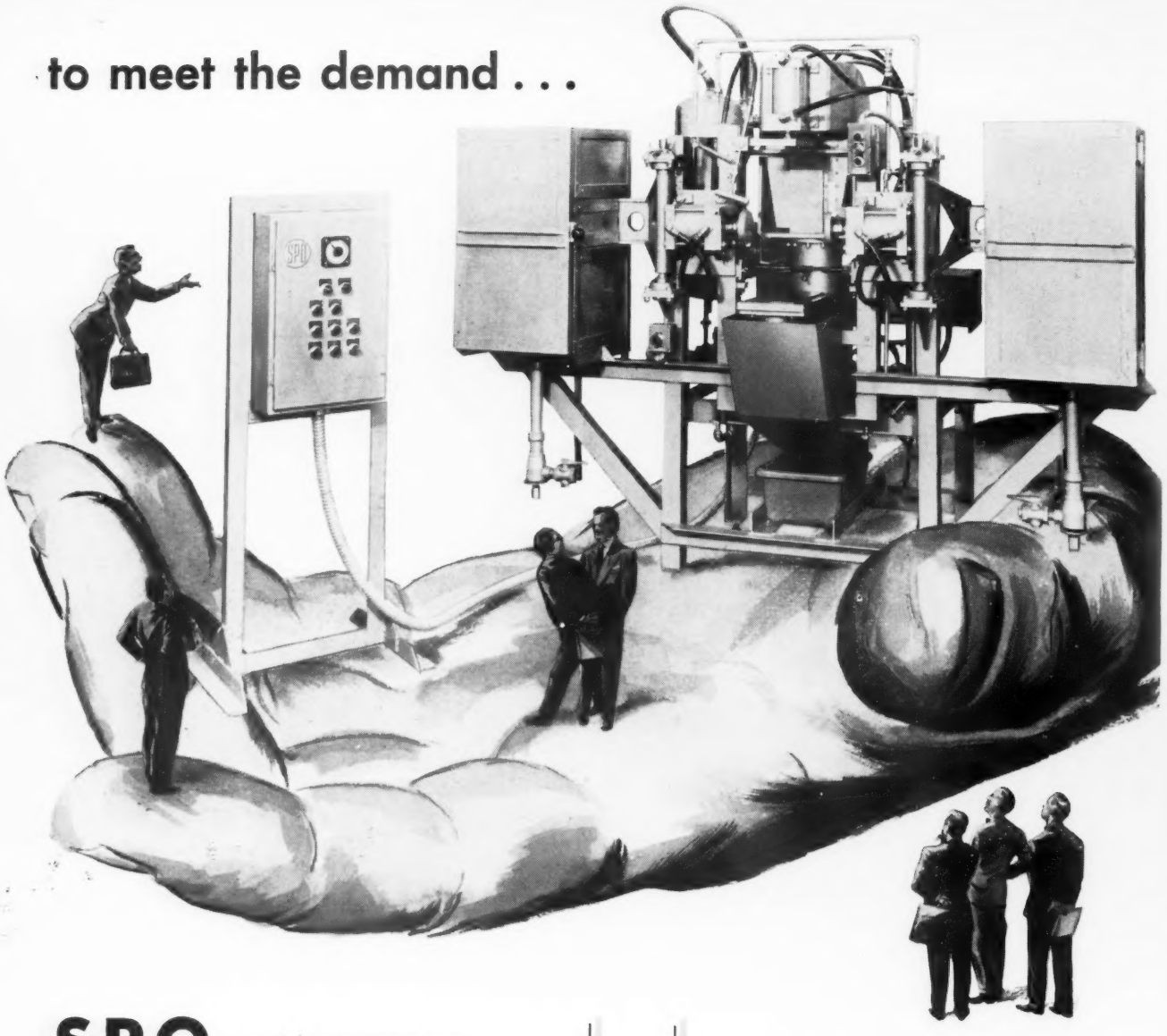
Through application "know-how" and product quality

CARBORUNDUM

REGISTERED TRADE MARK

continually puts more sense in your abrasive dollar

to meet the demand . . .



SPO PRESENTS THE MODEL 20 holo-core MACHINE

These intricate precision cores were produced with SPO Holo-Core machines.

Immediate acceptance . . . and sales . . . of SPO's first hollow core machine, the Model 10, showed the need for a similar unit of larger capacity. And this is it . . . *the new Model 20.*

Featuring the same basic simplicity, economy and speed of operation, Model 20 will handle core boxes up to 20 x 16 x 10 inches in size. It produces ready-to-use uniform standard cores in a 45-second cycle. Both semi-automatic and manually operated models are available.

SPO Holo-Core machines are the answer to core production and quality control problems. Hollow cores permit faster, easier shake-out . . . eliminate venting problems . . . assure closer tolerances and more uniform castings.

Write for Bulletin SC-100 for details and prices.

SPO INCORPORATED

6449 GRAND DIVISION AVENUE
CLEVELAND 25, OHIO

8655-S1

Controlled compressed air has given Industry muscle-saving power to produce more . . . economically . . . without fatigue . . . more safely.

Compressed air has become a must in every plant. If you are not now using it, investigate it. And—wherever you actually use compressed air—you'll make its use more effective if you use the best valves possible—Schrader Valves. They are designed and built by a company whose success dates back to 1844—more than a century of experience in air control.

In the complete line of Schrader Valves you'll find two-, three- and four-way models . . . for hand, foot, cam, pilot or solenoid operation . . . for practically any application.

Find out how Schrader Valves can put compressed air to work to save you money. For specification data, write—or, if you prefer, fill out the coupon below.

Schrader
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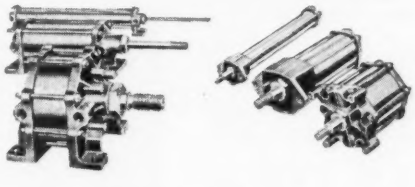
LEADERS IN AIR CONTROL SINCE 1844



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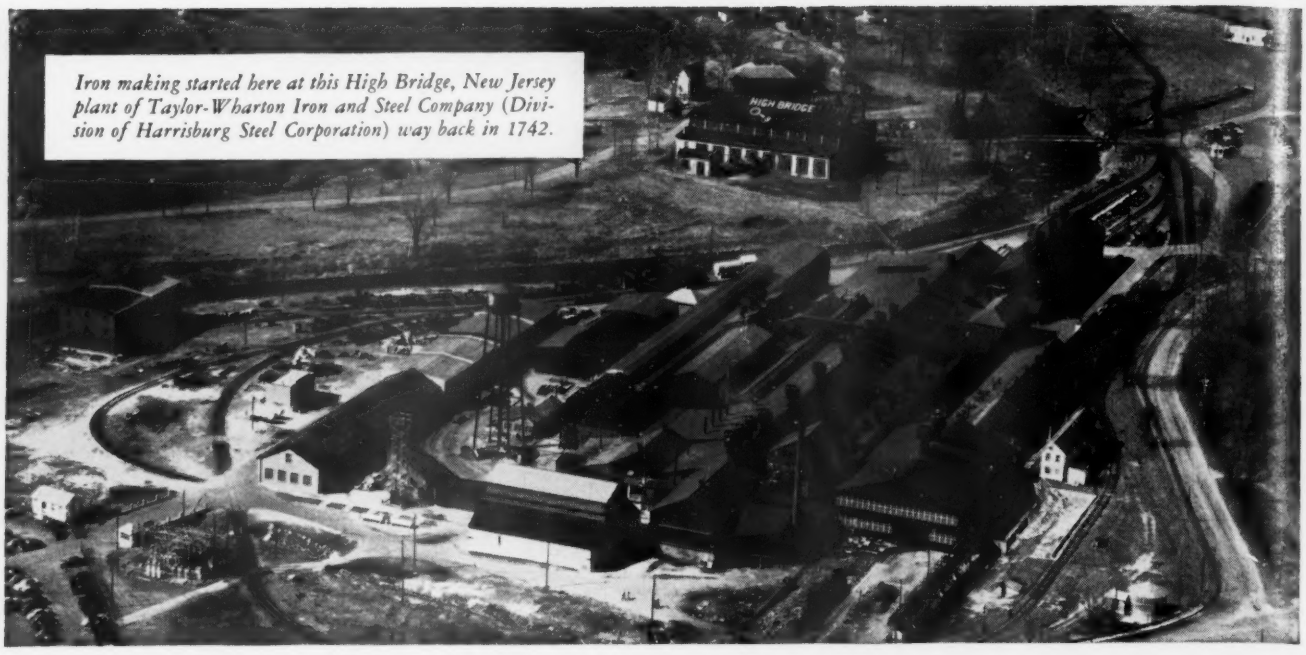


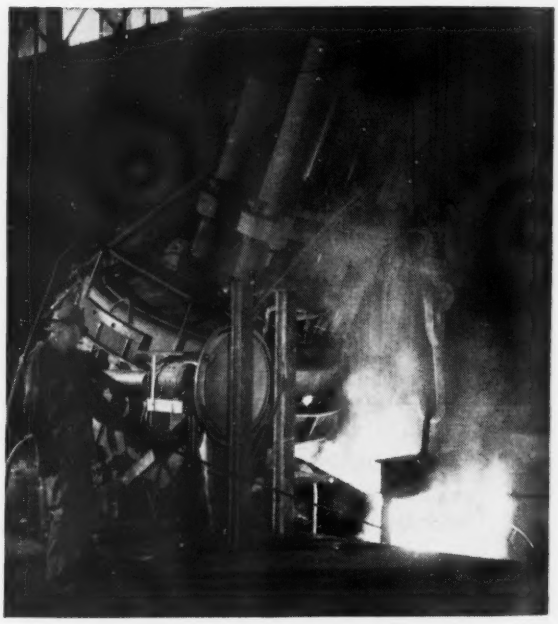
Iron making started here at this High Bridge, New Jersey plant of Taylor-Wharton Iron and Steel Company (Division of Harrisburg Steel Corporation) way back in 1742.

Two Lectromelt* Furnaces share in this two-centuries-of-progress success story

WITH well over two centuries of iron and steel making as a background, Taylor-Wharton have kept pace with modern alloys and equipment. Their manganese steels, under the Tisco trademark, are well known wherever impact- and wear-resistant steels are required. So, too, are their carbon and low alloy steels.

A Type S Lectromelt Furnace poured their first heat of electric furnace steel in 1929. The top-charged OPT Lectromelt Furnace got into production just ahead of Pearl Harbor in 1941. Mr. Knox T. Apgar, Melting Superintendent, says of both furnaces, "The versatility of our two Lectromelt Furnaces, the fact that we can vary applied voltages over so wide a range, enables us to control carbon in our steels very exactly."

To versatility and accuracy of control, add sturdiness and durability, and you'll understand why Lectromelt Furnaces are so popular throughout industry. For a copy of Catalog 9-A describing them, write Pittsburgh Lectromelt Furnace Corporation, 314 32nd Street, Pittsburgh 30, Pennsylvania.



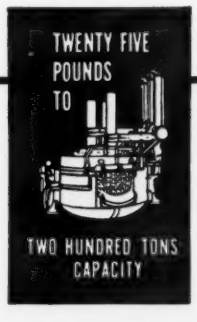
Tapping an 11,000 pound heat from their Type OPT, top-charged Lectromelt Furnace.

Manufactured in... GERMANY: Friedrich Kocks GMBH, Dusseldorf... ENGLAND: Birlec, Ltd., Birmingham ... FRANCE: Stein et Roubaix, Paris. . BELGIUM: S. A. Belge Stein et Roubaix, Bressoux-Liege... SPAIN: General Electrica Espanola, Bilbao... ITALY: Forni Stein, Genoa... JAPAN: Daido Steel Co., Ltd., Nagoya

*REG. T. M. U. S. PAT. OFF

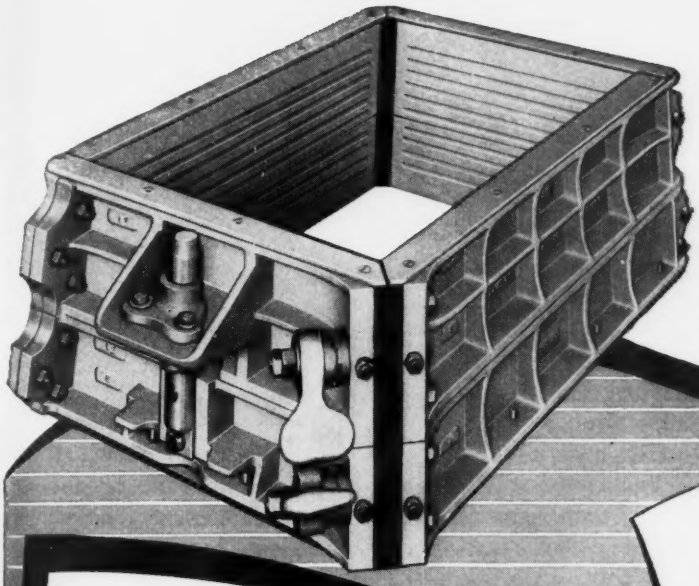
MOORE RAPID

WHEN YOU MELT... *Lectromelt*



The Last Word

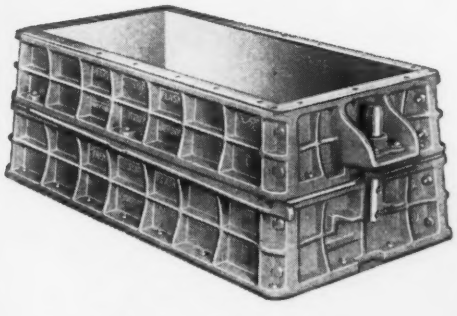
FREMONT SPREADLOCK FLASKS



No sand can lodge in the open corners of Spreadlock flasks. The corner gaps are completely closed by long-life, easily replaceable, live rubber inserts. Made of magnesium, which has twice the tensile strength of aluminum, they afford much longer service and are easier to handle. Accurately machined inside surfaces and flanges, and steel-faced top and bottom flanges assure more exacting work.

PERFECT ALIGNMENT INDEFINITELY!
Guaranteed by the one-inch GROOVLOCK FOOLPROOF PIN on

FREMONT STANDARD SLIP FLASKS



Particularly adapted to cope or drag pattern jobs. Solid, bolted and welded corner construction. Other types of standard pin fittings available.

SAVE BIG MONEY!
The precision machined and drilled, bolted corner construction of

FREMONT CAST IRON OR CAST ALUMINUM JACKETS

permits easy insertion of new sides or ends. Entire jacket need not be scrapped. The standard style is designed for ordinary foundry practice, the grooved style, which permits ready gas escape, is ideal for steel foundries. Flasks and jackets can be assembled on 3°, 4° or 5° taper.

Write today for free literature and prices. All orders given prompt attention.

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Fremont, Ohio

Lindberg-Fisher manufactures all types of Aluminum Melting and Holding Furnaces for permanent mold application— Gas-Oil- Electric resistance.

Lindberg-Fisher engineers can intelligently recommend the type of furnace to best suit your needs and conditions.

Melting specialists for 25 years

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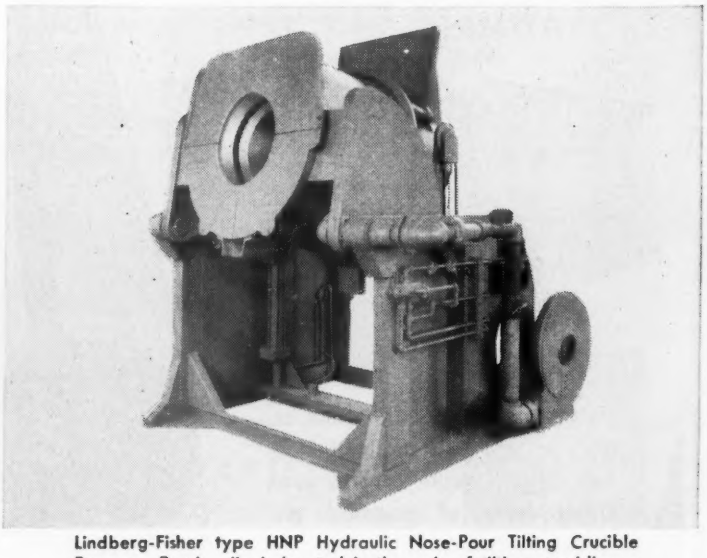
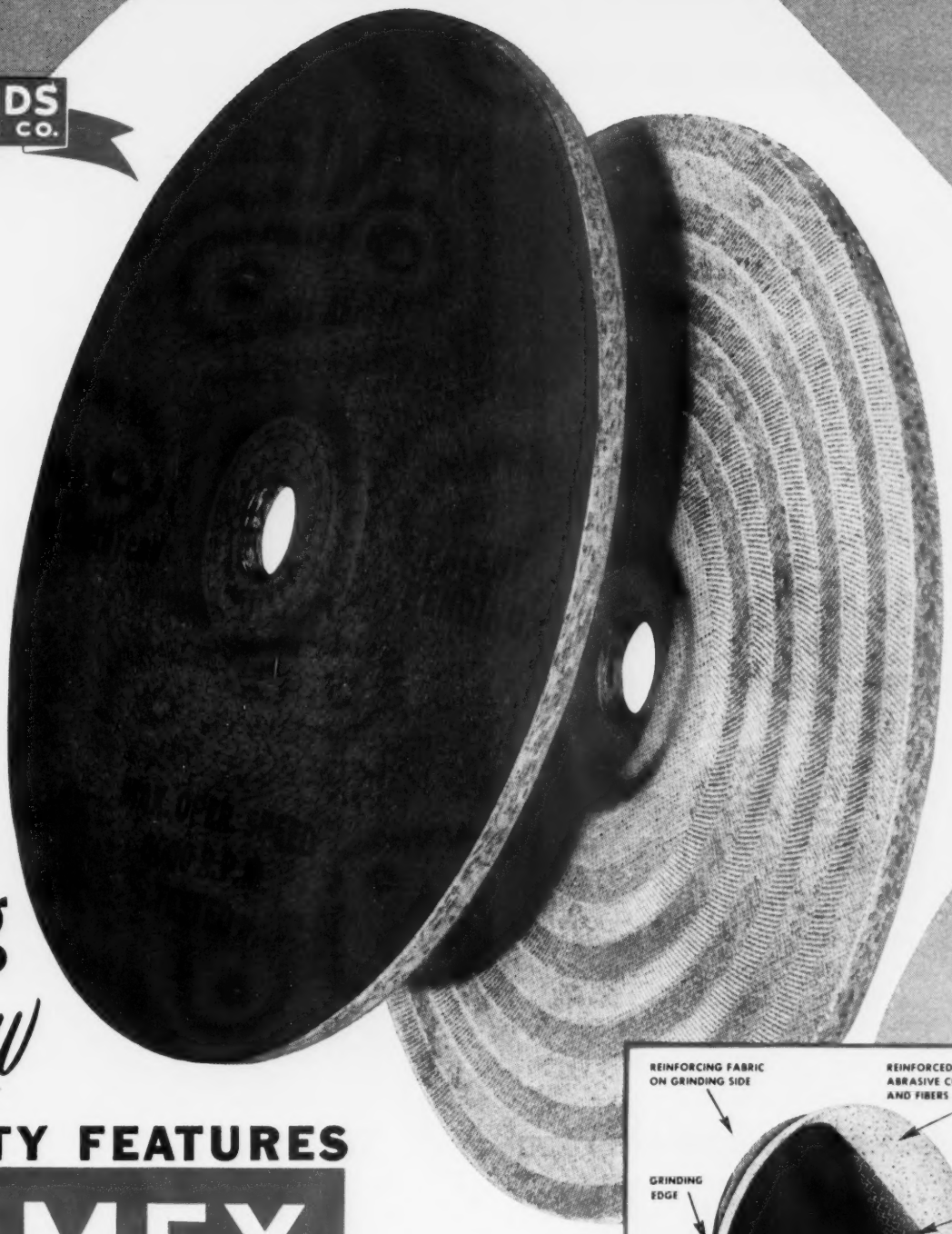
Lindberg-Fisher Electric Resistance Aluminum Melting and Holding Furnace equipped with heavy duty resistance elements which give uniform distribution of heat, insuring long element and pot life. Capacities up to 1000 lbs. Described in Bulletin 320.

Lindberg-Fisher type ADC Aluminum Melting and Holding Furnace. Capacities up to 1000 lbs. of aluminum. Oil or gas fired. Described in Bulletin 301.



Lindberg-Fisher type HNP Hydraulic Nose-Pour Tilting Crucible Furnace. Pouring lip is located in the axis of tilting providing a constant pouring arc regardless of degree of furnace tilt. Capacities up to 1000 lbs. of aluminum. Oil or gas fired. Described in Bulletin 57-A.

SIMONDS ABRASIVE CO.



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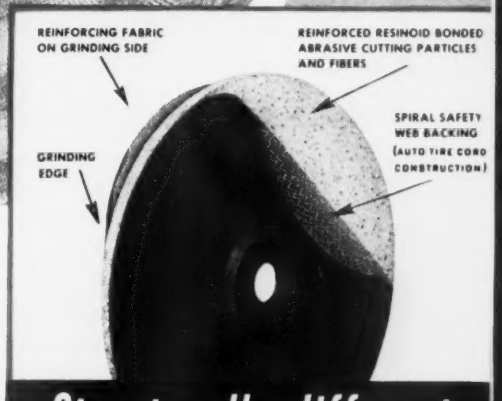
extra strong

with *new*

SAFETY FEATURES

SIMEX® RED WHEEL


REINFORCING FABRIC ON GRINDING SIDE
REINFORCED RESINOID BONDED ABRASIVE CUTTING PARTICLES AND FIBERS
SPIRAL SAFETY WEB BACKING (AUTO TIRE CORD CONSTRUCTION)
GRINDING EDGE

Structurally different

for production grinding, weld grinding, cleaning-up

Lightweight, rigid and reinforced resinoid bonded, this new faster cutting abrasive wheel, stands up safely to any directional stress. Wheel mass is reinforced throughout with thousands of alpha cellulose fibers. Top side has extra safety web backing of spiral wound rayon auto tire cord. Grinding side has knurled pattern for extra cutting speed and fiber layer for added strength.

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SIMONDS ABRASIVE COMPANY • PHILADELPHIA 37, PA.

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Extra Savings
FROM YOUR
SIMONDS DISTRIBUTOR'S
STOCK • SERVICE • KNOW-HOW

New

PAYLOADER®

Model HAH

Bucket Capacity — 1cu. yd.
Lifting Capacity — 4,000 lbs.
Carry Capacity — 3,000 lbs.
Breakout Force — 4,500 lbs.
Torque Converter Drive
Power Steer

Which best fits your needs?

New

PAYLOADER®

Model HA

Bucket Capacity — 18 cu. ft.
Lifting Capacity — 3,000 lbs.
Carry Capacity — 2,000 lbs.
Breakout Force — 3,000 lbs.
Torque Converter Drive

Now, Hough, the pioneer and leader in the tractor-shovel industry, gives you a choice of two new, more productive "PAYLOADER" units. Both have front-wheel-drive and rear-wheel-steer—especially designed for fast handling of sand and other foundry materials both indoors and outdoors. They're the finest of their type in Hough history—they're both way ahead of the field in design, performance and all-round value.

FEATURES of these outstanding new models include: 40° bucket tip-back at ground; torque converter drive; full-reversing transmissions; closed, pressure-controlled hydraulic system; large hydraulic brakes; shock absorber in hydraulic system that prevents pressure shocks and facilitates bucket control; power steer on model HAH. Your nearby "PAYLOADER" Distributor is eager to show what these new machines can do for you.

Use the coupon below to get full information on any "PAYLOADER" model

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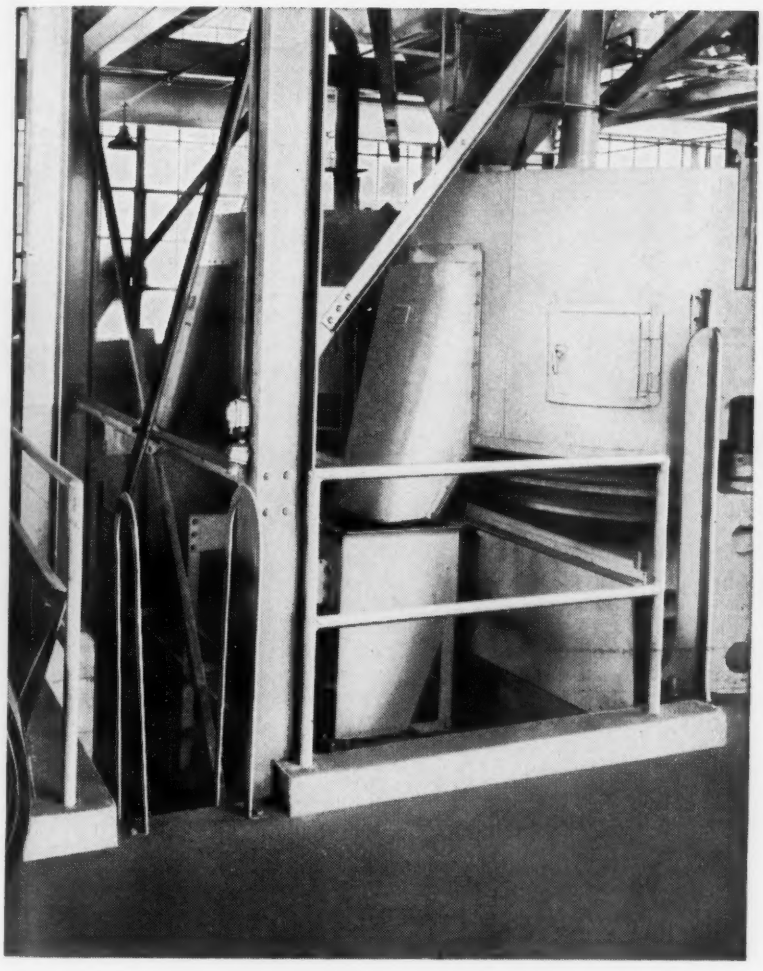
Send data on "PAYLOADER" units **Model HA ☐** **Model HAH ☐** **larger sizes ☐**

Name ..... **Title** ..... **Firm** .....

Street ..... **City** ..... **State** .....

THE *Clearfield* MIXER



gives *consistent uniformity* in your sand

Automatic time controls on the Clearfield Mixer permit the use of a predetermined, uniform procedure without depending on the human element. This gives you precise control over length of tempering, quantity of bond, and all other factors—you don't have to mix sand by your operator's "instinct". The result is consistent uniformity . . . the Clearfield way. These controls may be added to any Clearfield Mixer.

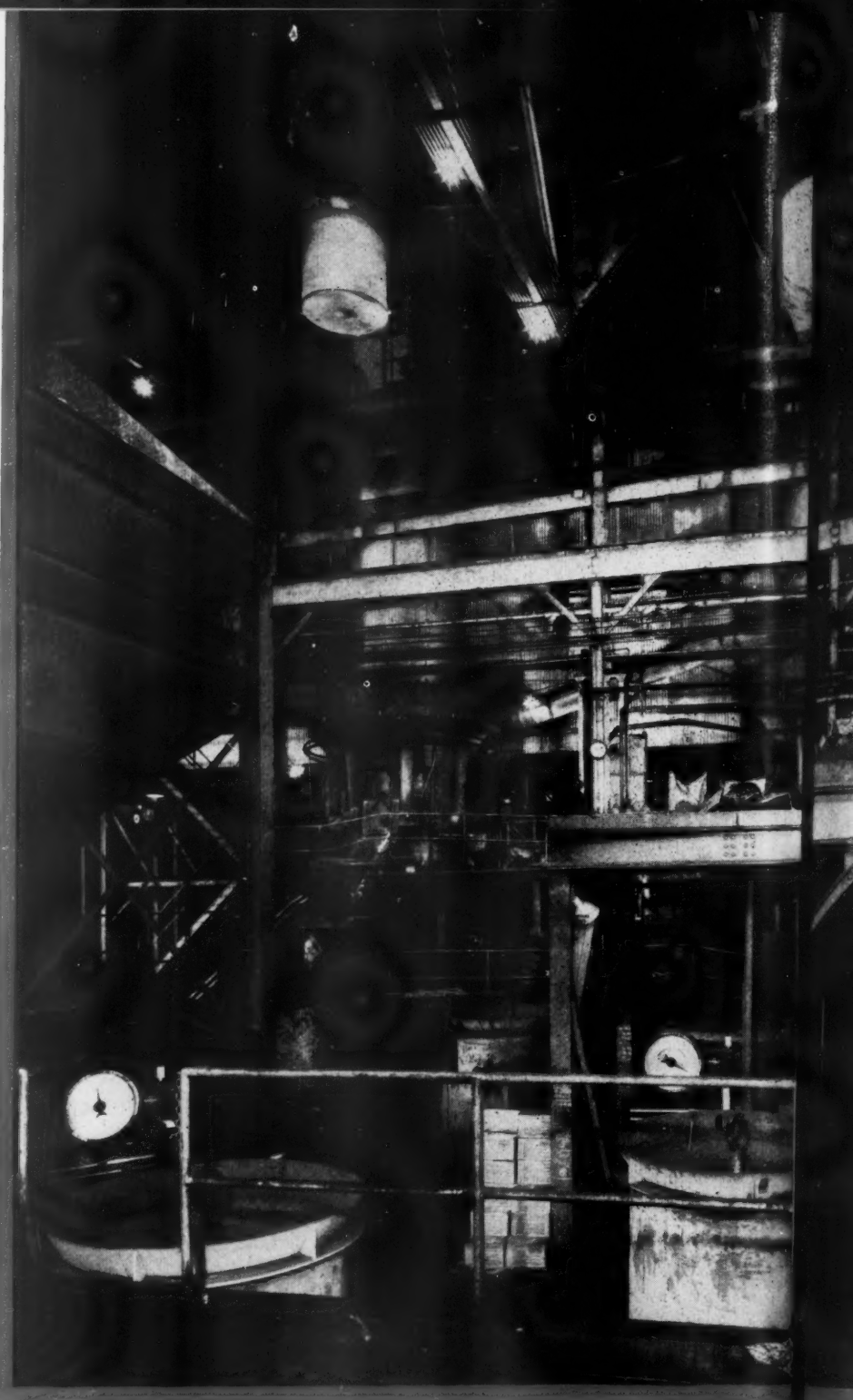
Write today for Catalog No. 83. See what we mean by "A Clearfield Mixer for every need!"

CLEARFIELD MIXER mixes, tempers, aerates

CLEARFIELD MACHINE COMPANY

Clearfield, Pennsylvania, U. S. A.

Whiting Cone-Bottom Bucket ▶
suspended from the Whiting Horse-shoe Charger on its way to the cupola.



Trambeam System ▶
automatically conveys full ladles to pouring bays, returns them empty.

◀ **Trambeam Monorail Switch**
permits hand switching of empty pouring ladles from main track for refilling.

NATIONAL MALLEABLE

Gets steady, dependable charging with

one man control

... and Whiting equipment

Operations at National Malleable and Steel Castings Co., Cleveland, require steady, dependable charging to produce an average of 55 to 65 tons of metal an hour during a 16-hour day. To maintain this production pace, they installed two unique and efficient "one man" charging systems. Each of the two systems is comprised of two Whiting cupolas which are serviced by nine Whiting Cone-bottom Charging Buckets and two Whiting Horseshoe Chargers. A crane operator loads metal charges into buckets with magnet and chute. Then, a single operator stationed at each system loads and weighs the buckets by means of a continuous "merry-go-round" conveyor. Buckets are transported to the cupolas via the Horseshoe Charger.

The metal is tapped into pouring ladles which are conveyed by means of a Whiting Trambeam monorail system to the pouring bays. Whiting engineered switches permit moving the ladles off the main monorail track to any of several bays without delay. Empty ladles are switched back onto the main Trambeam track and returned automatically for refilling.

This operation shows how Whiting equipment and engineering is used for profitable foundry operations.

Write today for information on Whiting's complete line of foundry equipment.

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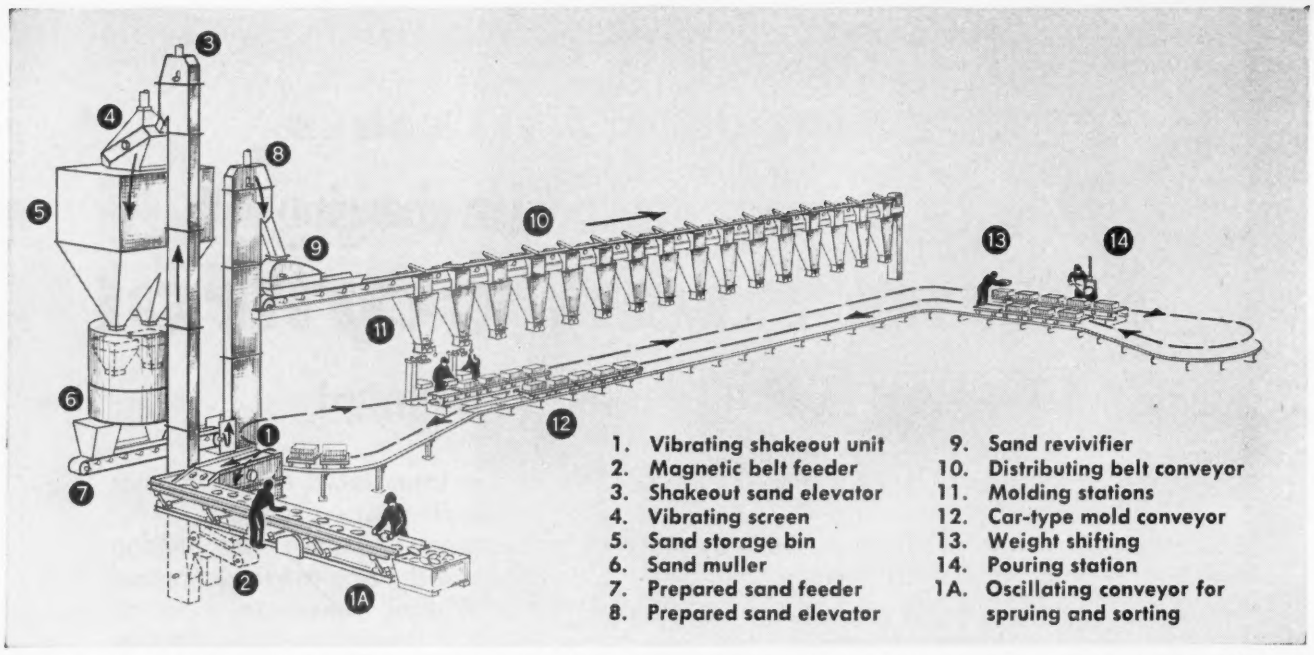
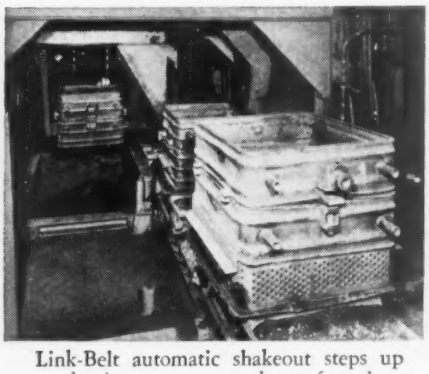
Whiting Foundry Products Include:

Cupolas . Cupola Spark Suppressors . Cupola Hot Blast Equipment . Cupola Blast Moisture Control Equipment . Cupola Charging Systems Cradle Furnaces . Hot Metal Mixers . Duplex Melting Systems Air Furnaces . Electric Melting Furnaces . Ladles . Ladle Handlers Ladle Preheaters . Tumbling Mills . Annealing Ovens Transfer Cars . Pulverizers . Pulverized Coal Firing Systems Turntables . Electric Traveling Cranes . Trackmobile . Trambeam Overhead Handling Systems

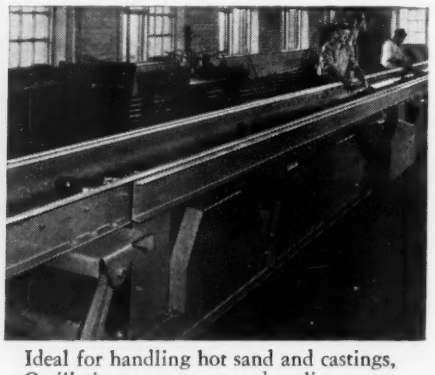


In this modern foundry layout, movement of sand and castings is completely mechanized. With Link-Belt conveying and preparation equipment, gray iron, steel, malleable and non-ferrous foundries can have lower costs, increased output.



Link-Belt automatic shakeout steps up production, removes workmen from hazardous areas, frees them for other jobs.

Conditioned sand is quickly, conveniently distributed to molders' hoppers by flat roll belt conveyor with adjustable plows.



Ideal for handling hot sand and castings, Oscillating conveyors speed cooling, sprung and sorting of castings while en route.

Link-Belt mechanization not only makes large and small foundries a better place to work - - it

raises production-lowers unit costs

TODAY, large and small foundries alike find modernization the only answer to intensified competition. To bring down their costs and make the most efficient use of manpower, they have conveyorized sand and casting handling to a degree undreamed of even a few years ago.

Many of these progressive foundries are completely equipped with Link-Belt conveying and preparation equipment. And just as others have been able to produce better castings at lower cost, Link-Belt mechanization can step up your profits, too. That applies whether your foundry is gray iron, steel, malleable or non-ferrous. Whatever you require in equipment or engineering services, Link-Belt can cut your operating costs . . . and at the same time make your foundry a better place in which to work.

Whenever you have a castings or sand handling or preparation problem, you'll find it pays to call your nearby Link-Belt office. Ask for Book 2423. It shows Link-Belt's complete line of modern equipment for ferrous and non-ferrous foundries plus 7 tested layouts.

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for faster release, fewer rejects...

use DOW CORNING Silicone RELEASE AGENTS

Developed especially for the metal casting industry, Dow Corning *Silicone* parting agents assure clean, easy release every time with a minimum of build-up on even the most complex patterns. They reduce your cleaning costs to the vanishing point, and speed production of uniform shells. See for yourself — send for *free samples* today!

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One application of this new, easily diluted solvent type silicone parting agent provides easy release for several resin-sand shells. Easily applied to either hot or cold patterns . . . wets surface rapidly . . . leaves uniform silicone film that's heat-stable and oxidation resistant.

NOTE **— for best pattern break-in, use Dow Corning 7 Compound.**

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MIDLAND, MICHIGAN

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The XACTEMP PYROMETER makes possible better quality control and helps toward elimination of blowholes, burnouts, sand infiltration and other flaws due to incorrect temperature . . . affords a simple, effective means for accurate temperature measurement of molten, non-ferrous metals. Well-balanced, easy to handle . . . always ready for use and requires no preliminary adjustments.

Cast aluminum and brass construction. Indicator is of medium resistance not affected by thermocouple length . . . acts rapidly . . . provided with Alnico V magnet and direct reading dial starting at 50° F. 43" stainless steel extension . . . standard 7" Marshall tip permits true readings below surface of metal. Made to give good service for years. Order at once to be sure of immediate delivery from stock.

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Thermocouple Supplies • Industrial Furnaces & Ovens
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Readers' Comment

Sees Many Changes Ahead

TO THE EDITORS:

I would like to take this opportunity to express my appreciation and that of my associates for the very fine article you people published about our process in the November issue of FOUNDRY. We think the whole thing was done very well. We were indeed complimented by the amount of space you gave to our operation, and were especially pleased with the cover picture.

We feel the next ten years will bring forth some very unusual and interesting technical changes in the foundry industry. Changes I have observed in the past 25 years differentiate methods which were largely art from methods which today are carefully controlled and based upon scientific knowledge. Your organization and technical publication has been most helpful in keeping people informed regarding such changes.

MORRIS BEAN
President and General Manager
Morris Bean & Co.
Yellow Springs, O.

* * *

How Best To Use Your Time

TO THE EDITORS:

Congratulations to you and William Oncken for his excellent article "How an Executive's Time Can Be Used Efficiently," which appears on p. 261-266 of your November issue. May I please have two copies.

JOHN J. BRENZA
Staff Metallurgist
Koppers Co. Inc.
Metal Products Division
Baltimore 3

* * *

Gas Turbine Era Is Near

TO THE EDITORS:

I want to compliment FOUNDRY, and particularly Bob Herrmann who did an outstanding job on the subject of automotive gas turbines. There was considerable food for thought in this article and the manner in which it was developed and presented was certainly an interesting one, especially from the foundry point of view.

It would appear to me that the people who are currently major suppliers for piston engines would have just cause for concern. As surely as we embarked on the era of the piston engine we are on the threshold of the gas turbine era, and we will no longer require pistons, camshafts, piston rings and cylinder heads, to mention a few. This article is of particular interest to us as we feel that where gas turbines go, investment castings will play an important part.

I would like again to express my thanks on behalf of the Investment Castings Institute for the fine publicity work FOUNDRY did on our annual meeting. It is just such continued interest that tends to elevate the quality of our industry, and in the final analysis gives greater prestige to the foundry industry in general.

T. OPERHALL
President
Misco Precision Casting Co.
116 *West Gibbs St.*
Whitehall, Mich.

* * *

Standards Present Problem

TO THE EDITORS:

We would like to obtain a number of copies of J. B. Caine's paper on "Magnetic Particle Inspection Standards" in your December issue. This article is the best I've seen on this increasingly burdensome problem.

H. T. SMITH
Chief Inspector
Key Co.,
ACF Industries Inc.
East St. Louis, Ill.

* * *

Students Study Article

TO THE EDITORS:

We wish to take this opportunity to thank you for sending 14 copies of your reprint "The New Chevrolet Tonawanda Foundry" for distribution to our senior students for a reading and study assignment.

G. A. SELLERS
Professor and Head
Dept. of Industrial Engineering
Kansas State College
Manhattan, Kans.

* * *

Progress in Education

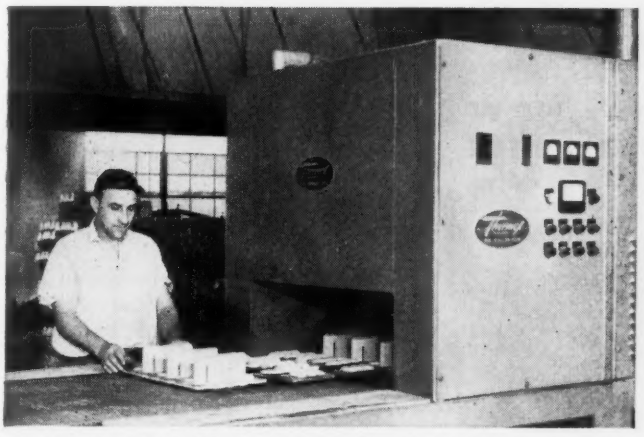
TO THE EDITORS:

Technical education in the foundry industry has gone a long way since John Penton started FOUNDRY in 1892. Prior to the appearance of FOUNDRY, the only outlets for technical subjects in the foundry industry were *Scientific American* and *American Machinist.*

In these publications, from the late seventies up to the early nineties, there appeared articles by Simpson Boland, Robert Masters, T. D. West, H. McCaslan, and others. Mr. McCaslan is the only one of the men mentioned still alive.

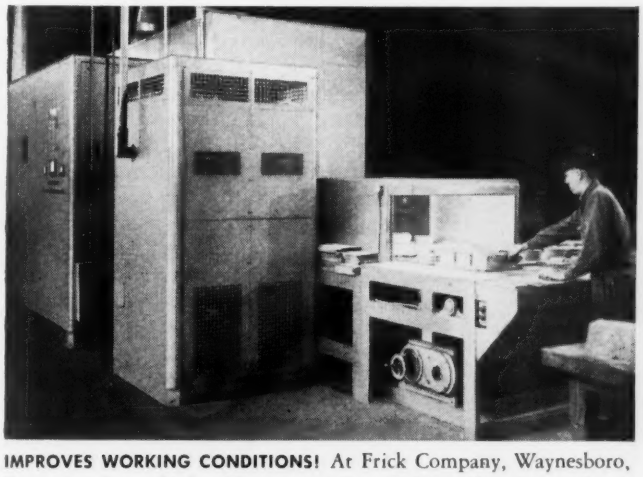
Mr. West was one of the first to put his ideas into book form. His *Moulders' Text Book* had a wide cir-

How you *CUT COSTS* with Thermex Electronic Core Baking Equipment

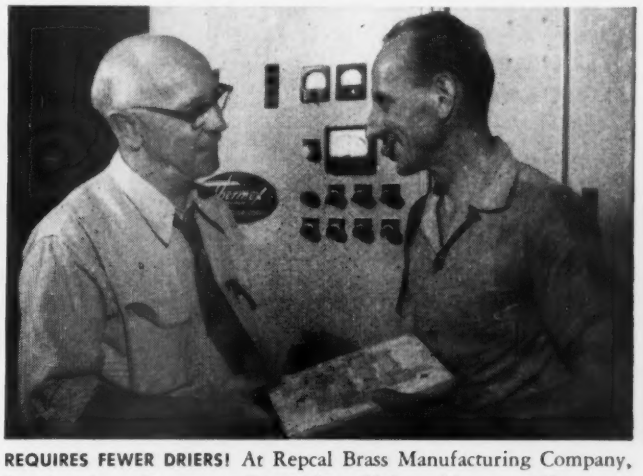


STREAMLINES FLOW! Boose Aluminum Foundry, Reamstown, Pa., has increased coreroom output 33% per manhour. Cores move continuously from maker through their two 15 kw THERMEX units in tandem. No storage required. Minimizes handling. Cores from ½ ounce to over 20 pounds can be baked simultaneously.

PRODUCES BETTER CORES! James B. Clow & Sons reports: Uniform electronic baking eliminates stresses and subsequent surface cracks or dimensional instability. Cores won't sag, don't require reinforcing rods. Surfaces are smoother and harder. Their cores range in size from ½ ounce to 400 pounds.



IMPROVES WORKING CONDITIONS! At Frick Company, Waynesboro, Pennsylvania, a 60 kw THERMEX Core Baking Unit has replaced ovens. Working conditions have been greatly improved . . . no smoke or oven heat. Cores' quality has been improved. Production is faster, more flexible . . . used for about 20,000 different castings.



REQUIRES FEWER DRIERS! At Repcal Brass Manufacturing Company, Los Angeles, a THERMEX Core Baking Unit enables one shift to produce more cores than two shifts with conventional baking equipment. Now, 35 driers produce 4500 cores continuously; formerly, 400 driers produced 1600 cores. Total estimated savings per year: $10,000.

THERMEX—Trade-Mark Reg. U. S. Pat. Off.

CUTS BAKING TIME! James B. Clow & Sons, Coshocton, Ohio, proved the advantages of THERMEX Core Baking Apparatus with a 15 kw unit in the production of cast iron pressure pipe and pressure pipe fittings. Next they purchased two 60 kw units and one 75 kw unit. The resultant streamlined core production netted a reduction of 96% in baking time and 33% in coreroom manhours.

The
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A DIVISION OF NATIONAL CYLINDER GAS COMPANY

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CAPACITIES: from ⅛ to 1 ton. Single and 3 phase. ¼ ton model weighs only 51 pounds.

$149.50 and up

Built to serve you without costly maintenance

Lodestar is the first truly "heavy duty" version of the small electric hoist. The CM Lodestar is designed to operate without costly maintenance or interruptions in your work schedules. The initial cost is practically your only cost with a Lodestar... an extremely low cost indeed!

WRITE US or call your CM distributor for literature, prices and quick delivery from stock.

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CM HOISTS AND CHAIN

culation in the eighties. In 1885, *Modern Moulding and Pattern Making* made its appearance from the pen of Joseph P. Mullen, M.C. By 1900 foundry technical education had begun to take its place in the schools and colleges.

The Pattern Maker made its advent about 1902, but passed into oblivion after a few years. One has only to look over old numbers of that publication to see how pattern-making has progressed. In one of the issues, back in 1905, for example, the making of a worm gear pattern is explained in detail as being cut from a solid cylinder by hand.

Technical education received a big impetus about the time of World War I and has maintained a strong pace since. Sand control is little short of a science now, and the study of chemical reactions in the cupola has a place in the modern foundry.

The aim of all foundries is to produce high quality castings with a minimum of bad castings. In small plate work a few bad castings make little difference. But in the case of a heavy casting with complicated cores, requiring the work of several men for several weeks, one bad casting may run into a great loss.

Many rule-of-thumb methods formerly in use in the foundry have to a large measure been eliminated. Factors in good casting production are generally figured as good metal and fuel in the cupola, up-to-date melting and molding practice, good sand, and well-made cores. And perhaps most important of all, proper gating, which is so well covered in the late Pat Dwyer's book.

As I see the picture of things to come, the next two decades will see nothing short of a revolution in foundry practice, in general.

E. R. WATERMAN
1101 *Church St.*
San Francisco

* * *

Resin Figure Too High

TO THE EDITORS:

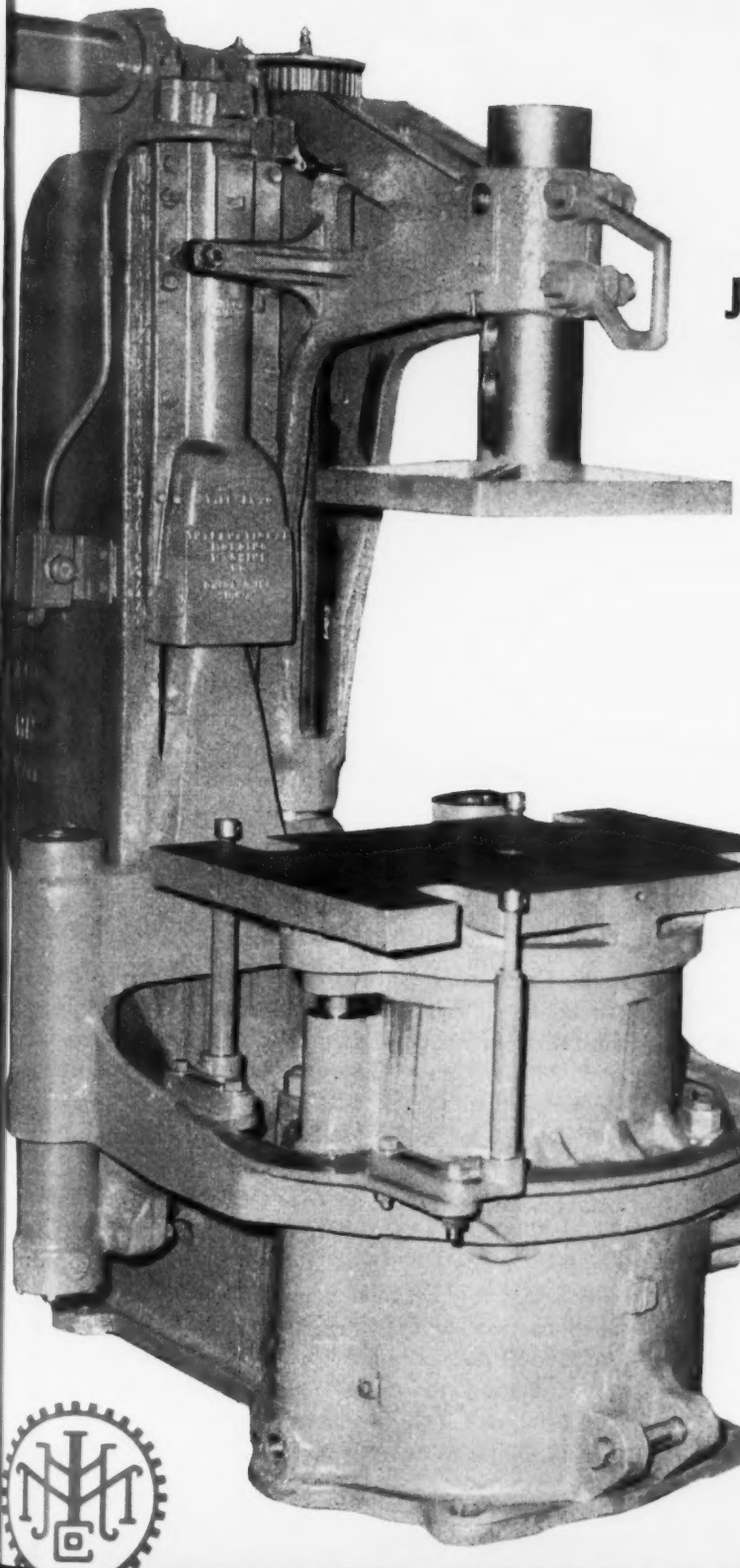
Congratulations on your excellent editorial in the October issue. It is reassuring to us in the field to see such a healthy comment for shell molding.

In case this hasn't been brought to your attention, I would like to point out a discrepancy in the terminology of resin consumption figures in the third paragraph. While we foundrymen are accustomed to dealing in tons, the chemical industry normally uses pounds; hence the figure should be 0.25 and 8 million pounds for 1950 and 1954, respectively.

JACK E. BOLT
Chemical Materials Department
General Electric Co.
Pittsfield, Mass.

INTERNATIONAL

TYPE PK 20 MACHINE



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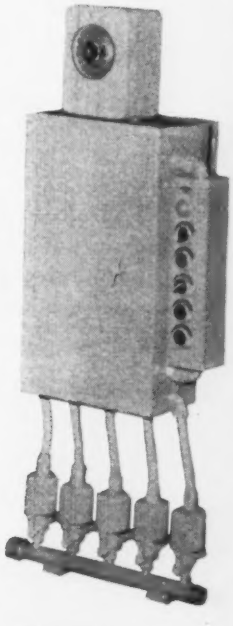
Three Models to Suit Your Requirements

1. Hand Operated
2. Hand Operated—with Electric Jolt Timer
3. All Purpose Automatic Electric Control Cycle
   - Simply set dial for the number of Jolts wanted—Easy—Rapid Adjustment
   - Continuous Complete Full Cycle—or Split Cycle to allow Strike-off after Jolt, or Manual Operation
   - Ready Adjustment of Cams for Complete Timing Cycle—Fast—Positive—Dependable

Safety Features Throughout
Built to Fit All Foundry Jobs

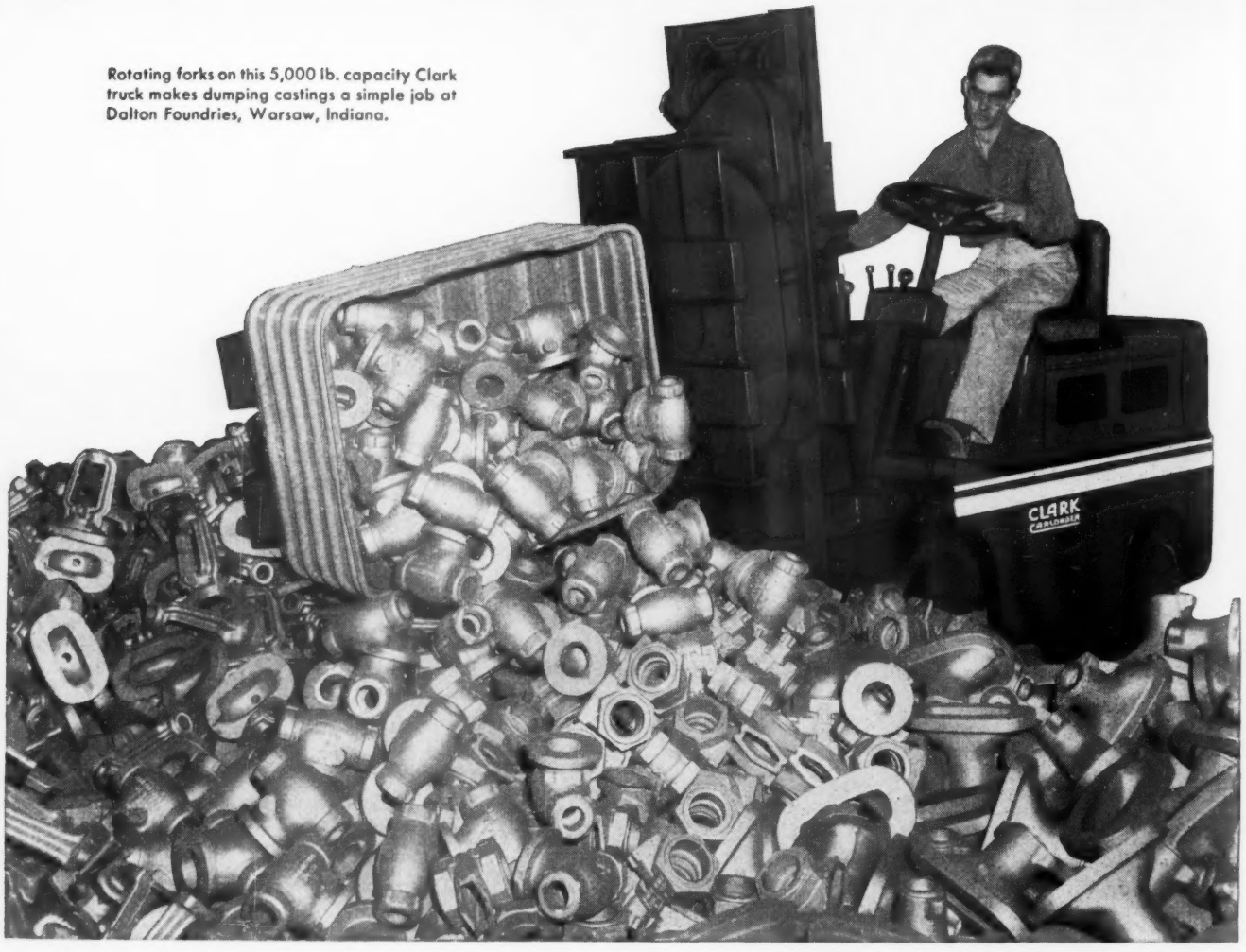


Automatic Cycle control panel. A separate, complete unit, mounted to fit your particular foundry needs.

INTERNATIONAL MOLDING MACHINE COMPANY

LA GRANGE PARK, ILLINOIS

Rotating forks on this 5,000 lb. capacity Clark truck makes dumping castings a simple job at Dalton Foundries, Warsaw, Indiana.



WHAT DOES THIS JOB COST YOU?

In Dalton's grey iron foundry, Clark trucks handle 200 tons of castings a day. At the malleable furnace *one* man now dumps 55 tons of scrap into the furnace in just 4 hours. In the annealing department Clark trucks go directly into the ovens to stack pots five high. From shakeout to shipping, Dalton's Clark trucks are lifting, moving, dumping; performing a multitude of jobs throughout the foundry at lowest possible cost. Take a close look at your own operation —what are these jobs costing *you?*

This Clark truck drives right into annealing oven to stack pots of castings five high. Just one of *many* jobs for which Dalton depends on their Clark trucks.

The quickly changed shovels, rotating devices, or dumping hoppers are just a few of a complete line of attachments that can make a Clark truck the most versatile tool in your foundry. Gas, LP gas, diesel or electric—from ½ ton to over 12 tons capacity—each truck able to make a specific operation just part of a dozen jobs. One Clark truck can make the competitive difference in *any* foundry, while the money saved usually more than pays for the equipment. LOOK IN THE YELLOW PAGES UNDER "TRUCKS, INDUSTRIAL" FOR THE CLARK DEALER NEAREST YOU.

DON'T MISS THE MATERIAL HANDLING SHOW, JUNE 5-8, CLEVELAND, OHIO!

CLARK® EQUIPMENT

Industrial Truck Division
CLARK EQUIPMENT COMPANY
Battle Creek 16, Michigan

Gaining or Losing?

Are castings gaining or losing ground in competition with other forms of engineering materials? Numerous instances can be cited in which stampings, forgings, plastics or weldments have replaced cast parts. On the other hand, castings frequently have been adopted for components previously fabricated by other methods.

How closely do these changes offset each other? Actually, there is no accurate answer, but there are some signs to indicate trends.

Despite the swings of the business cycle, the over-all tendency in production of castings has been upward the last ten years. Shipments in the 1951-1956 period were 15 per cent larger than in the preceding five years. Offhand this gain seems small, considering that the nation's average population increased 10 per cent and that the entire economy expanded rapidly between these two periods.

Comparing the steel industry's record since 1946 with that of foundries gives some clue as to how the latter have fared, because the fortunes of both industries are tied directly to general business conditions. The increase in average yearly steel production between the two halves of that period was 24 per cent, against the 15 per cent gain for castings.

It should be noted, however, that the steel industry also does not appear to have shared fully in the metalworking boom of the last decade. Even after allowing for depreciation of the dollar, government data show that manufacturers' sales in the metalworking industry since 1950 were more than 50 per cent ahead of those for the preceding five years.

An outstanding feature of the ten-year trend in foundry activity has been the wide variation in demand for different types of castings. Gray iron practically matched the industry's 15 per cent increase between the two five-year periods. Steel castings were slightly below the average gain and malleable iron was slightly above. But copper-base alloys barely held their own, and other metals showed these increases—25 per cent for zinc, 60 per cent for aluminum and 245 per cent for magnesium.

It seems clear that production of castings will continue to increase with the growth of the nation and its economy. However, the extent of this expansion will be affected to a large extent by 1) how successfully foundries are able to develop new applications for castings and 2) their ability to fight off competition for existing markets through the more economical manufacture of a higher quality product.

William G. Reese

Managing Editor

Risering of Steel

This is Part I of an article demonstrating, for several commercial-type castings, application of rules for scientifically risering steel castings. These rules were described in previous Naval Research Laboratory reports

By H. F. BISHOP and W. H. JOHNSON
Metal Processing Branch, Metallurgy Division
Naval Research Laboratory
Washington, D. C.

ONE OF THE long-range projects at the Naval Research Laboratory has been directed toward scientifically risering steel castings. The ultimate goal is to develop sufficient rules, formulas and charts so that riser locations and dimensions can be calculated for any steel casting and result in complete soundness and maximum casting yield.

Sufficient information now has been developed to permit riser calculations to be made for many types of steel castings. Such information pertains to the feeding range of risers in various section thicknesses and geometries[1,2,3], the application of chills on castings to increase feeding range[4, 5], and methods for calculating riser dimensions[6]. In obtaining this information, it was necessary to make many experimental castings; to save time and money, the castings were simple bar and plate shapes. The authors intended that the data obtained from these simple shapes could then be applied to the more complex commercial castings, which are essentially comprised of a variety of simple shapes joined together. It is realized, however, that commercial castings are seldom the ideal bar and plate shapes described in the research reports, and it will often be necessary to make certain approximations and interpretations in applying the data.

These risering data have been successfully used in the NRL foundry where steel castings of a commercial type are often made for experimental assemblies. The method of calculating size and location of risers for several of these castings is described here to show practical application of the

Fig. 1 (right)—Feeding ranges, sections of various thicknesses, shapes and plate combinations

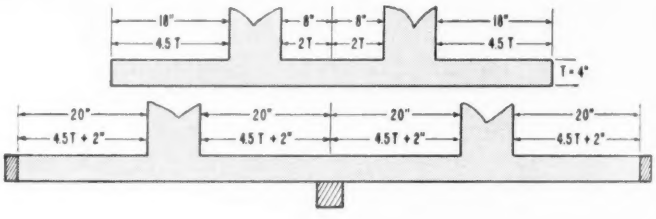
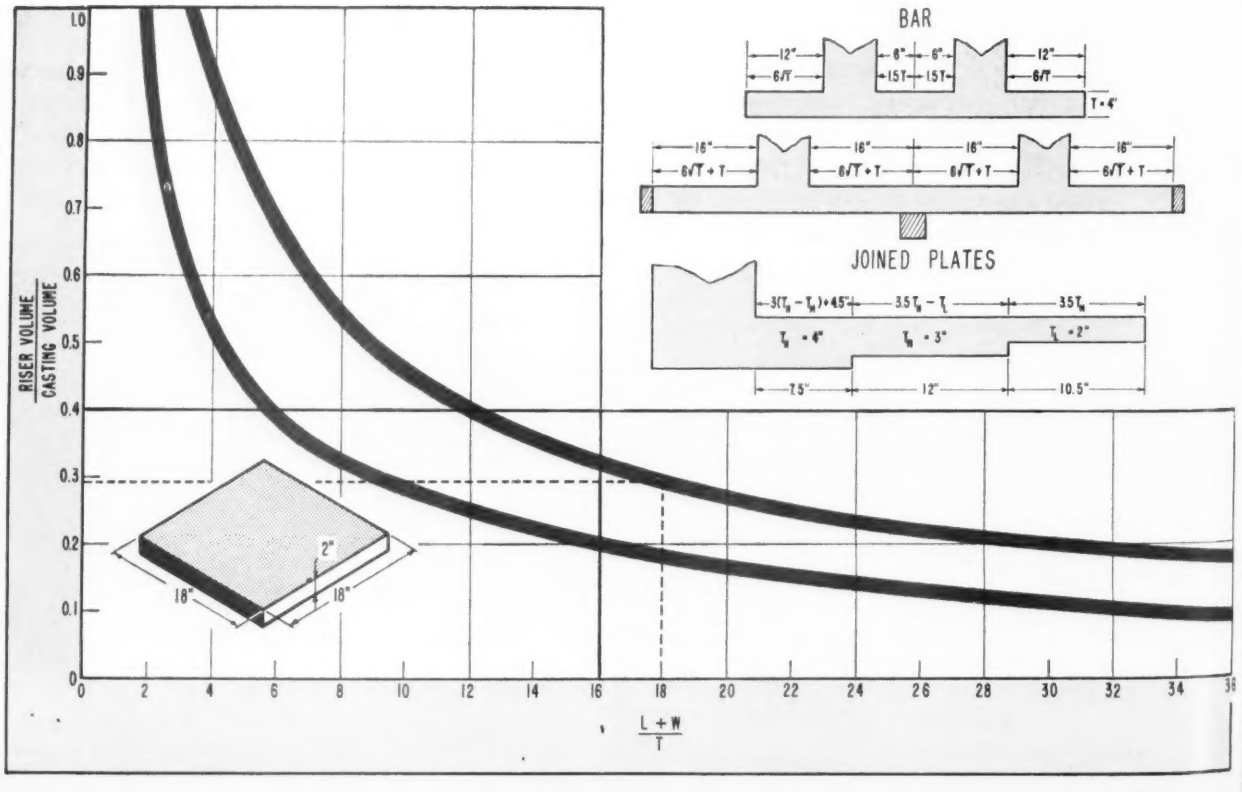


Fig. 2 (below)—Showing relation of shape factor to relative riser volume needed for feeding



research data. However, before describing the procedures for risering these castings, the formulas and charts needed for the calculations will be reviewed.

Location of Risers—The first step in risering a casting is, of course, to decide upon the location of risers—and chills if necessary—in order to insure that all portions of the casting are within the feeding range of a riser. To serve as guides in locating risers, the distances which risers can feed sections of various thicknesses, shapes and plate combinations under conditions where edge effects and chills are or are not present, are summarized in Fig. 1. This figure shows distances both in terms of formulas which express feeding distance in terms of T, the casting thickness, and in inches for the case where T is equal to 4 in.

For the case of the joined sections the numerical feeding distance is shown for 3 and 2 in. thick appendages attached to the 4-in. section. Attention is particularly directed to the marked effect of chills in extending riser feeding range in cases where risers must feed toward each other.

In the case of the 4-in. thick plate casting, Fig. 1, each riser can feed for a maximum distance of only 8 in. in the direction of the other riser; by placing a chill between the risers this feeding distance is increased to 20 in. per riser. Chills placed at a casting extremity cause only a minor increase in feeding range, however, because a natural chill effect already exists at these locations. This natural chill effect is due to the large surface area to volume ratio of the casting extremities.

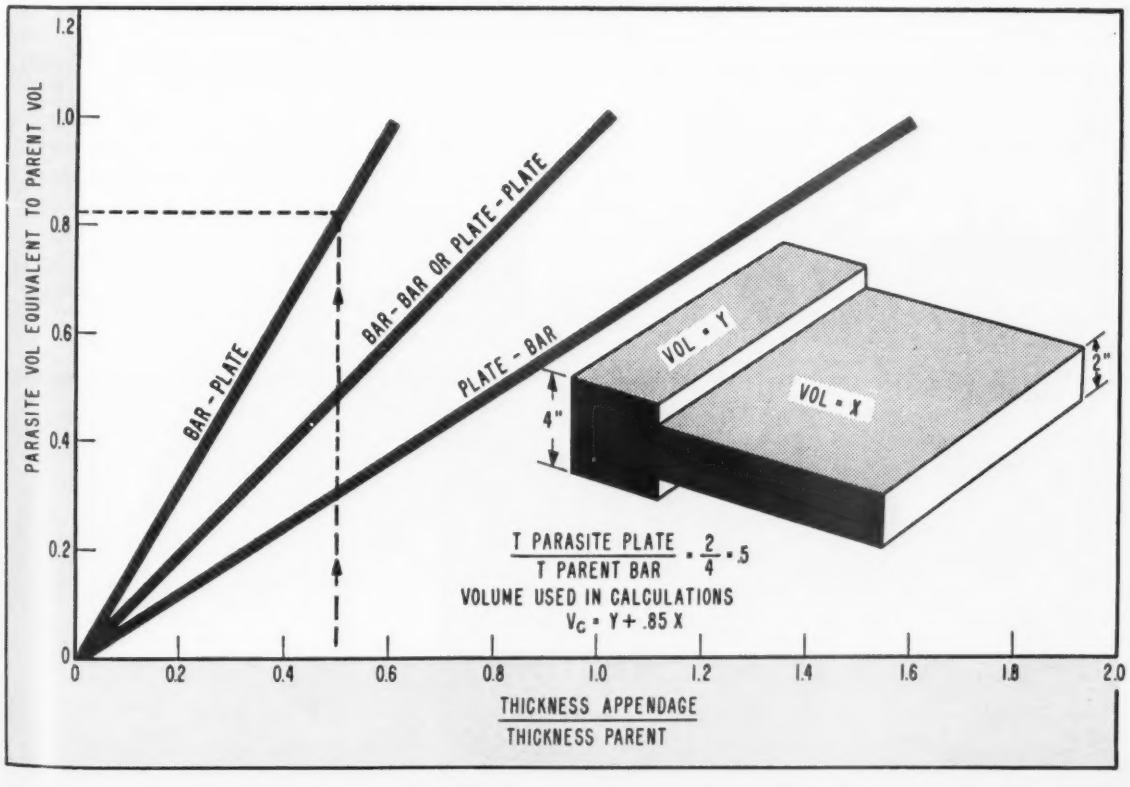
In the case of joined sections, it may be noted that the feeding range for each section is influenced by the sections adjacent to it. The feeding range in the heaviest section is usually less than $4\frac{1}{2}$T, the distance to which it can be fed when cast separately, because its end effect is partially destroyed by the presence of the lighter section attached to it.

The feeding range in the lightest section is usually greater than $4\frac{1}{2}$T, because the heating effect of its parent section produces extremely long gradients into it which permit better feeding. The gradients produced by such a parent section are usually much greater than gradients produced by a riser. The feeding range in the intermediate section of a combination, such as shown in Fig. 1, may be more or less than $4\frac{1}{2}$T depending upon the thickness of the sections attached to it.

Calculation of Riser Dimensions—The system for calculating riser dimensions requires the use of three charts. It is based upon the fact, first described by Caine[7], that riser efficiency increases as the surface area to volume ratio of the casting increases. A "chunky" casting such as a cube, which has a low SA/V ratio, will require a riser having a volume approximately equal to that of the casting; a "rangy" casting such as long plate casting, which has a high SA/V ratio, can be fed with a riser having a volume of less than 20 per cent of the casting volume.

In the present system the surface area to volume ratio of the cast section to be fed is expressed by a shape factor which is equal to the length plus

Fig. 3—Chart shows relative appendage volume to be added to the parent volume to determine minimum riser volume



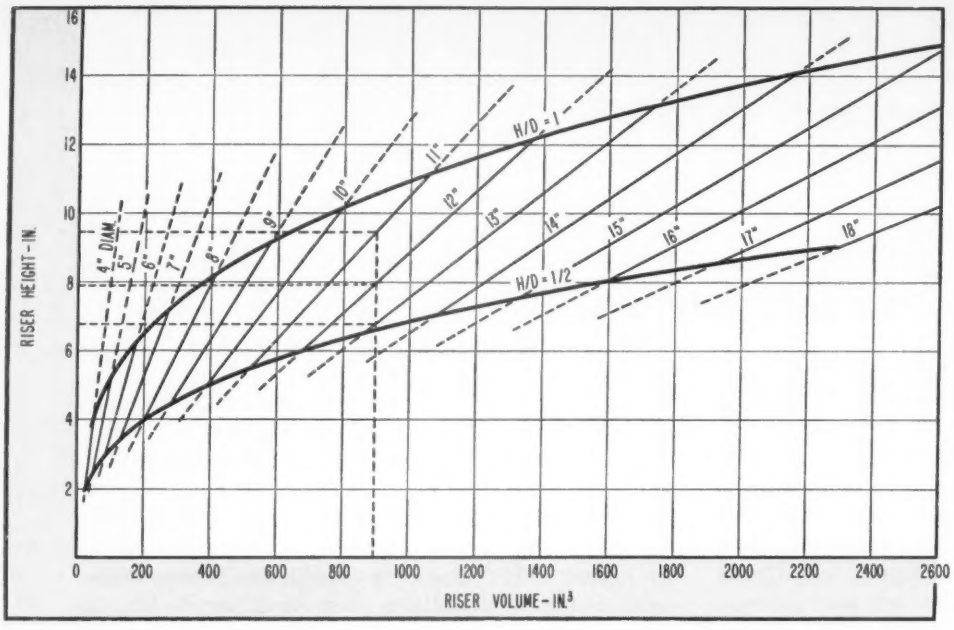


Fig. 4 — Chart interrelates riser height, diameter and volume to facilitate translation of the riser volume into actual riser dimensions

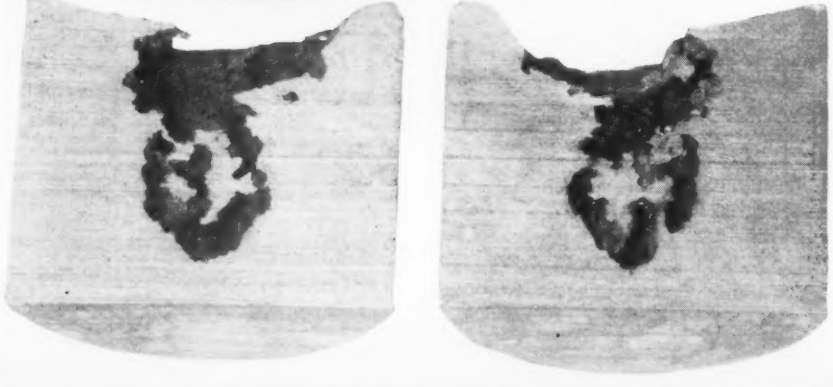
width divided by the thickness, (L + W)/T, of the section. The shape factor chart, Fig. 2, indicates the relative riser volume needed to feed sections having different shape factors. The data obtained from experimental castings made to establish the shape factor and relative riser volume relationships fell within the band of Fig. 2. Apparently, minor foundry variables affect riser efficiency within the limits represented by the band. Therefore, in using this method for choosing risers, it is recommended that risers first be chosen which correspond to the top region of the band, as shown in Fig. 2, to provide a margin of safety.

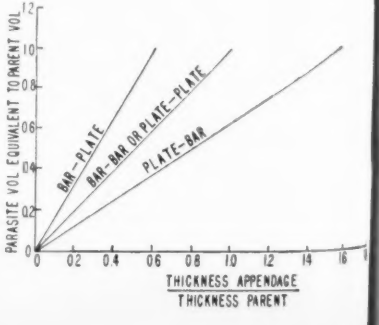
If experience shows that such risers are excessive, subsequent castings may be risered from intermediate positions within the band. In the example of Fig. 2, the 18 x 18 x 2 in. plate has a shape factor of 18 which (at the top of the band) indicates a riser volume of .3 of the casting volume. It is indicated, however, that castings such as this have been made with a riser volume of only .2 of the casting volume (bottom of band).

Commercial castings usually consist of joined sections of different thicknesses and geometries. In such cases it is the practice to place the riser on the most massive section so that the thinner sections can be fed by the large section, which in turn is fed by the riser. The volume of riser metal needed for such castings is less than if the volume of the thin sections were present as an extension of the massive section. For example, less riser volume is needed to feed a casting which is comprised of a 4-in.-thick section with 2-in.-thick sections attached to it than would be required to feed a casting of identical volume which was a uniform 4-in.-thick section.

To determine risers for such complex castings by the present method, it is necessary that the fraction of the volume of the thin, or appendage, sections which is equivalent to volume in the massive or parent section insofar as riser requirements are concerned, be determined. This is necessary because the (L + W)/T factor for complex castings is determined from only the parent section, and the relative riser volume indicated on the shape factor chart applies only for such sections.

Fig. 5—Support base casting and sectioned riser





Complex castings are essentially combinations of plate and bar shapes of different sizes; hence, the chart of Fig. 3 was developed to indicate the fraction of the volume of the appendage sections which is equivalent to volume of the parent section. Different relative appendage volumes may be required for different shape combinations even though their thickness ratios are the same. Consequently, curves are shown in Fig. 3 for four different cases: Parent plate with appendage plate, parent plate with appendage bar, parent bar with appendage plate, and parent bar with appendage bar. The curves for the plate to plate and bar to bar combinations coincide. The example presented in Fig. 3 shows a 4-in. bar parent section with a 2-in. plate appendage section, and it is indicated that .85 of the volume of the appendage is considered as casting volume in the calculations. Thus, in determining a riser for the casting of Fig. 3, the (L + W)/T factor would be determined from the dimensions of the 4-in. bar section; the Rv/Cv factor thus indicated would be multiplied by the sum of the true volume of the 4-in. bar section and .85 of the volume of the 2-in. plate section.

It is to be emphasized that regardless of the shape, thickness and volume of the appendages attached to the parent shape, the (L + W)/T factor is determined only for the parent shape. In translating the relative riser volume indicated by the (L + W)/T factor into true riser volume, the true volume of the parent shape plus the percentage of the appendage volume indicated in Fig. 3 is multiplied by the Rv/Cv factor.

The third chart, Fig. 4, simply interrelates riser height, riser diameter, and riser volume to facilitate translation of the riser volume determined from the preceding charts into actual riser dimensions. The upper and lower curved lines on the chart connect points representing riser heights equal to 1 and to ½ times the riser diameter, respectively; it has been found that risers with these height-diameter ratios are the most efficient. In this risering system if the required volume were to be obtained with risers having dimensions such that they fall above the band, they often would be insufficient. Thus, if a riser having a volume of 900 cu in. is required, the choice of riser dimensions, as indicated in Fig. 4, is limited to a 13-in. diam 7-in. high, 12-in. diam 8-in. high, or 11-in. diam. 9½-in. high. These are the possibilities.

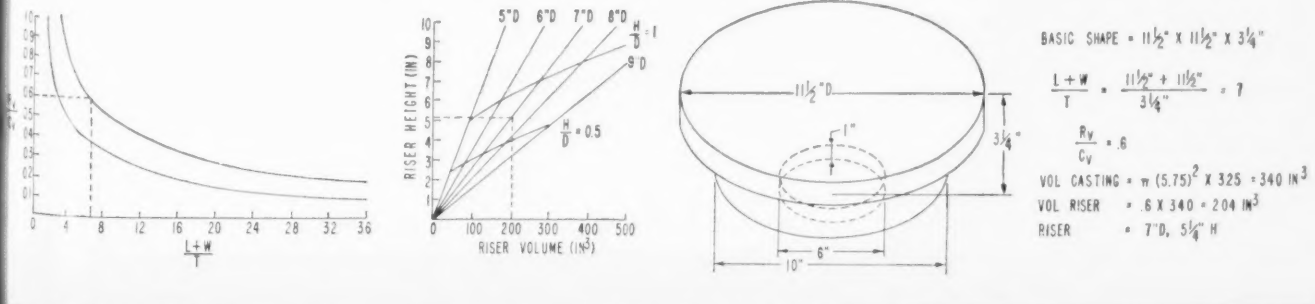
Support Base Casting—Fig. 5 shows one of the castings risered according to the Naval Research Laboratory risering procedures; also shown is the riser for this casting after it was removed and sectioned. The choice of the riser location for this casting is limited to the top of the casting, and all the regions of the casting are well within the riser feeding range. The method of calculating the dimensions of the riser used is shown in Fig. 6.

In calculating the (L + W)/T factor for circular shapes, both the length and width dimensions are considered to be the diameter of the casting. Thus, a 11½-in.-diam casting has the same (L + W)/T factor as does a 11½-in. square block of the same thickness. The reason for this is apparent when it is considered that the (L + W)/T factor is simply a means of expressing surface face area to volume relationships of the shape; calculations will show that a circular shape has the same SA/V ratio as a square shape of the same thickness, with length and width dimensions equal to the diameter of the circular shape. However, after determining the shape factor which indicates the relative riser volume to be used, the true volume of the shape is considered in calculating the actual riser volume needed.

In obtaining the casting measurements needed to make the necessary calculations for risering, simplifying approximations may often be made. By working to the upper limits of the shape factor band there will be a safety factor which permits safe riser size determination to be made from measurements and calculations which are only approximate. For example, the casting of Fig. 5 has a section 11½-in. in diam above a 10-in.-diam section. Between the two sections is a generous fillet. The depth of these two sections is 3¼ in. Below the 10-in.-diam section is a 6-in.-diam, 1-in.-thick section. In calculating riser size this casting is treated as though it were of a uniform 11½-in. diam and 3¼ in. in depth—in other words, a cylinder. The reduced volume resulting from a reduction in the diameter from 11½-in. to 10 is ignored; however, as compensation the volume of the small cylindrical shape at the bottom of the casting is also ignored.

The (L + W)/T factor for this casting is 7, which indicates a relative riser volume of .6. The

Fig. 6—Riser calculations for support base casting shown in Fig. 5



volume of the casting is calculated to be 340 cu in., and this figure multiplied by .6, the relative riser volume, indicates that a riser with a volume of 204 cu in. is needed. Referring to the riser dimensioning chart, second from left page 73, we find a riser 7 in. in diameter and 5¼ in. high will supply this volume. Since this casting has no appendages, the bottom chart, page 72, is not needed for the riser calculations.

Mounting Base Casting—This casting and the sectioned riser (4.5 in. diam, 3.5-in. high) which fed it are shown in Fig. 7. The calculations made to determine the riser dimensions are shown in Fig. 8. By locating one riser atop the heavy section all portions of the casting are within the feeding range of this riser. The riser can feed a 1¾-in. section for a maximum distance of 8 in. (4½T) and the actual depth of this section is only 5½ in. The 1-in.-thick appendages can easily be fed through the heavy parent section.

As shown in Fig. 8, the (L + W)/T factor is determined from the 1¾ x 5½ x 7-in. central section since this is the section of the casting upon which the riser is located. From the (L + W)/T factor obtained, it is indicated from the shape factor chart at top left of Fig. 8 that the riser volume should be .5 of the casting volume. Since this casting represents a parent-appendage combination, only a fraction of the appendage volume is considered as casting volume. Hence, the volumes of the parent and appendage shapes must be determined separately. By coincidence the volumes of both the parent shape and appendages are 63 cu in., as shown by the calculations in Fig. 8.

In calculating the volume of the two 1-in.-thick appendages, it will be noted that the measurements and calculations made are again approximate; the cored holes and the triangular projections on the appendages were ignored. It was assumed that the volume of metal in the projections compensated for the absence of metal in the openings; hence, each appendage was considered to be a simple rectangle having dimensions of 1 x 8½ x 4 in., which makes the calculation of appendage volume quite simple. The thickness ratio of the appendage to parent section is approximately .5. The top right chart, Fig. 8, shows that for such a plate to plate combination only half of the appendage volume should be considered in the calculations. The equivalent casting volume then is the entire parent shape volume plus half of the appendage volume, or 102 cu in., which when multiplied by the Rv/Cv ratio indicates that a volume of 51 cu in. is needed in the riser. This riser volume can be supplied by a riser 4½ in. in diam and 3½ in. high (left chart, Fig. 8).

(To be concluded next month)

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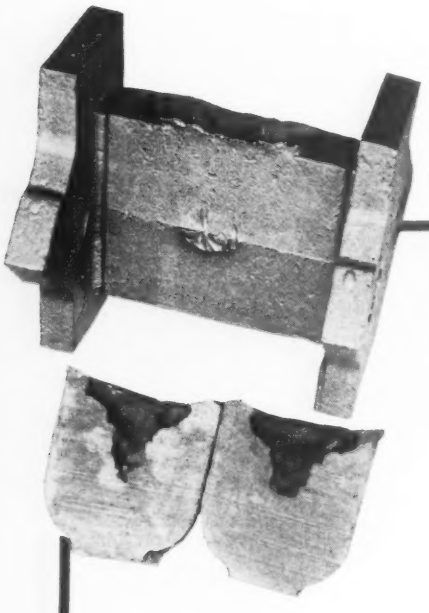
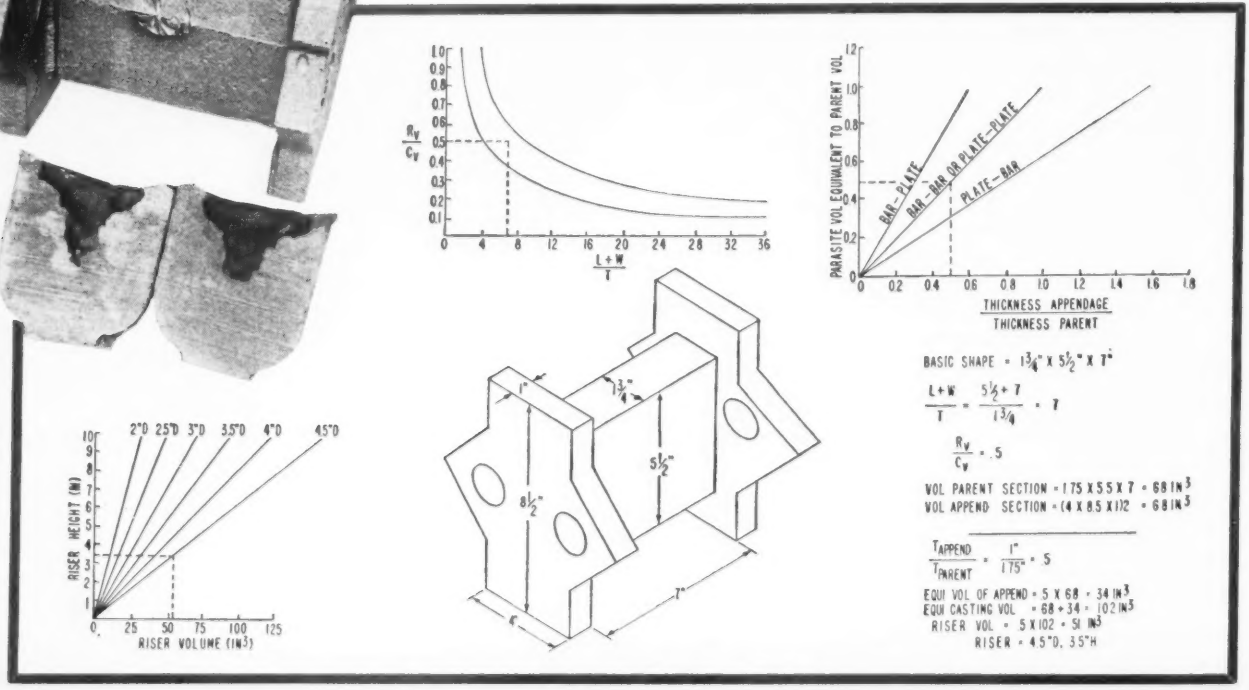


Fig. 7 (left)—Mounting base casting and its sectioned riser
Fig. 8 (below)—Riser calculations for mounting base casting


Rv/Cv
L+W/T
PARASITE VOL EQUIVALENT TO PARENT VOL
BAR-PLATE
BAR-BAR OR PLATE-PLATE
PLATE-BAR
THICKNESS APPENDAGE / THICKNESS PARENT
RISER HEIGHT (IN)
2"D 2.5"D 3"D 3.5"D 4"D 4.5"D
RISER VOLUME (IN³)
1"
1¾"
5½"
8½"
BASIC SHAPE = 1¾" X 5½" X 7"
L+W/T = 5½+7/1¾ = 7
Rv/Cv = .5
VOL PARENT SECTION = 1.75 X 5.5 X 7 = 68 IN³
VOL APPEND SECTION = (4 X 8.5 X 1/2 = 68 IN³
T APPEND/T PARENT = 1"/1.75" = .5
EQUI VOL OF APPEND = .5 X 68 = 34 IN³
EQUI CASTING VOL = 68 + 34 = 102 IN³
RISER VOL = .5 X 102 = 51 IN³
RISER = 4.5"D, 3.5"H

An Introduction to

INCENTIVE SYSTEMS

Steps in the installation of a sound incentive system which will give maximum production at minimum cost are discussed here. The article is reproduced from a publication of the Gray Iron Founders' Society Inc.

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Cost Consultant
Gray Iron Founders' Society Inc.

FOUNDRY industrial engineering—which includes methods engineering, work simplification, time and motion study, establishment of production standards, incentive systems, etc., has replaced the old rule-of-thumb management in many foundries. In fact, to keep up with competition, it is becoming essential for most foundries to have in their organization someone who is familiar with modern foundry industrial engineering.

One of the most important problems in industrial engineering is the establishment of a sound incentive system. It is important not only because of the greater efficiency which can be attained by a sound system, but also because a poor incentive system can be a millstone around a foundry's neck.

It is therefore highly desirable that, before starting on such a process, the foundry manager should either find time to study incentive systems himself or should delegate this job to someone else. And it is hardly possible to understand the many problems involved in the installation of a sound incentive system without getting pretty deeply in the whole field of foundry industrial engineering. This article is intended merely as a sort of general introduction to this important subject.

High Production, Low Costs—The objective of a sound incentive system is to obtain maximum production at minimum cost. But to understand the proper approach the first thing to get clearly in mind is that maximum production is not dependent solely on the worker's effort. To an even greater extent it usually is dependent on equipment and methods. Unless equipment and methods are right—are such as to *make it possible* for a worker to attain maximum production—no amount of effort on his part will attain it. Consequently, before attempting to establish incentive rates, management should first increase production as much as possible by perfecting equipment and methods.

Unfortunately, many foundries are pretty weak on equipment and methods, particularly methods. If we designate as 100 per cent the production which could be obtained—by normal worker effort—with perfect equipment and methods, the present production in many foundries which have not made effective use of methods engineering is only about 50-60 per cent. I know that many readers will question this, as applied to their own foundries, but this is the consensus of most good industrial engineers with foundry experience. And if the foundry management has not studied its own operations by the methods used by trained industrial engineers, I doubt if it can determine what its own efficiency is.

It would, therefore, obviously be poor policy to set up standards or incentive rates until production has been brought up as near 100 per cent as possible by intensive application of methods engineering. Actual establishment of standards and incentive rates should usually be preceded by a period of preparation of at least one year.

It is beyond the scope of this article to attempt to give more than a very brief summary of how methods engineering is applied, say, to the molding operation. Very briefly, the equipment is checked first, including the molding machine, if any, and how it is being used, and the design of pattern and corebox equipment. Then the operation is analyzed into its component parts, or work elements, such as: Get and place flask, get and place pattern, shovel sand, ram (or squeeze) mold, roll over flask, draw pattern, set cores, strike off.

The actual time for each of these component operations is observed, the motions made and method used are observed, and an intensive study is made to find out how the time for each component operation can be cut to a minimum by better methods, easier motions, or better layout and auxiliary equipment or aids.

This sounds like a long, slow complicated process, but an experienced foundry industrial engineer can spot many inefficient methods and motions just by observing them, without a stop-watch. And many of the component operations are very much the same for all jobs, and the time which they should take can be standardized. In this way a lot of "standard data" can be accumulated which can easily be applied to any job.

If a foundry has no one with sufficient experience in this kind of work, it is usually good policy to employ a capable outside consultant. However, the experience of many foundries has demonstrated that the function of the consultant is not to "install an incentive system" but to *train*

the organization how to install and operate one. When the consultant finishes his job the organization *must* include someone who has sufficient knowledge of the techniques of industrial engineering to administer the incentive system successfully. So before engaging an outside consultant, it will usually be advisable to hire, as a permanent employee, someone with at least two or three years' experience in time study and methods engineering. This should reduce the cost and length of time of the service required from the outside consultant.

By the procedure outlined above, methods, motions and auxiliary equipment can be gradually improved until standard production times can be established which may reasonably be regarded as representing as near 100 per cent efficiency as possible.

The length of time required for completing this procedure will depend on several factors. These factors include the degree of efficiency at the start, the ability of the outside consultant, the caliber of the staff executive in charge of industrial engineering, the attitude of the foremen, relations between management and men, etc.

Strive for 100 Per Cent—When such standards have been established, every possible effort should be made to get production as close as possible to 100 per cent on a time-work basis. The standards will be tremendously valuable because it can be demonstrated that their attainment is possible. However, there is usually a limit to the efficiency which can be attained on a time-work basis. For example, in some shops which started with 50 per cent efficiency, it might be possible, by improvement of equipment, motion and methods, and by capable supervision, on a time-work basis, to get this up to say 70-80 per cent efficiency. When maximum efficiency attainable on a time-work basis has been reached, the shop is finally ready for the installation of incentives.

In this article I have used the term 100 per cent efficiency to represent the production which a worker can be reasonably expected to attain by normal effort, with proper allowances for fatigue, unavoidable losses of time, etc. Incentive rates would therefore be such that a worker would be expected to reach 100 per cent efficiency in order to earn his regular time-work rate. To earn more than this he would have to produce more than the standard production, and it would usually be expected that a good worker should be able to produce about 125 per cent of standard and earn 125 per cent of his regular time rate.

The above constitutes a brief general description of the procedure commonly used for installing a sound incentive system.

Remember that the reduction in *cost* will come from two sources:

1. The increase from 50 to 80 per cent of standard production brought about under time-work by improvement of equipment, motions and methods.

2. The increase from 80 to 100 per cent of standard production required to earn a regular day's pay brought about by the installation of the incentive system.

Increases in production above 100 per cent are accompanied by increases in pay, so that there is little or no saving in direct cost, although there will be a saving in overhead cost.

The industrial engineer is not the only one who can devise improvements in methods; it is perfectly possible for the worker himself to think of improvements in methods or motions which will cut production time. If management does not do a thorough job in discovering the best methods before incentive rates are established, the worker, after he is put on incentive, is quite likely to figure out better methods himself. He will therefore produce more than was considered reasonably possible when standards were established and his incentive rate for the job will be higher than it should be. This creates a problem, for it is a basic principle of incentive administration that incentive rates, once established, should not be cut unless there is a change in equipment or methods; and it is much harder to cut them when the changes have been

A successful incentive system must be preceded by adoption of efficient equipment and methods

thought up by the worker and not by the management.

There are two ways to handle this problem.

1. It is most important that the preliminary work of improving methods should be done as thoroughly and expertly as possible, so as to reduce these cases to a minimum.

2. The search for better methods should be continued in a systematic manner after incentive rates have been established, and there should be an understanding that incentive rates will be subject to review periodically, after periods of not less than a year, but that no rates will be cut unless there has been some change in equipment or methods which enables a worker to produce more with the *same effort*.

It should be noted that unusual earnings do not always indicate that incentive rates are too high. In cases where the incentive rate is entirely fair both to the worker and to the management, some men may earn considerably more than others either because they have unusual manual dexterity or because they are capable of unusual sustained effort and are willing to exert it. A change in the incentive rate is fair only when there has been a change in *method* which would enable *any* worker to produce more with the *same* effort.

Where the Danger Lies—Agreement among industrial engineers that production in many time-work foundries is only 50-60 per cent of what it should be shows how dangerous it is to start a piece-work system with rates set by foremen largely on the basis of present production. Such rates are often far higher than they ought to be and once established it is very hard to change them.

The substantial improvements in production which have been effected in many foundries merely by the application of methods engineering on a

time-work basis show how essential it is that a considerable period of preparation should precede the actual installation of an incentive system. They also suggest that the application of methods engineering may be worthwhile in many foundries where, for one reason or another, the installation of an incentive system may be considered impracticable or undesirable.

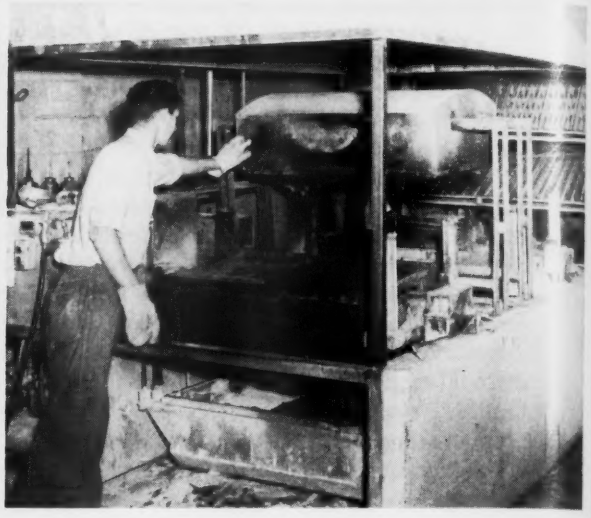
Some foundrymen seem to think that the establishment of an incentive system will reduce the amount of supervision required. They reason that the workers will have an incentive to put forth their best efforts and the foreman will be relieved of his responsibility to see that they produce a fair day's work. On the contrary, all industrial engineers agree that a sound incentive system will require more supervision—more attention from management—rather than less. The proper administration of an efficient incentive system is a severe test of the caliber of management, and the management of most time-work shops needs some strengthening to handle it successfully.

This article is intended to be a warning that the establishment of a sound incentive system is usually a long slow process, that it requires expert knowledge of industrial engineering, not only in the consulting firm, but also, ultimately, in the foundry's own organization. Also that an incentive system installed too hastily without the intensive application of methods engineering for a considerable period can be a serious handicap, not an asset.

Nevertheless, if the installation of an incentive system is approached properly, by the procedure outlined above, it is the best way so far discovered to attain maximum efficiency, and so many foundries have improved their efficiency in this manner that the pressure on their competitors to do so is becoming increasingly severe.

Shell Mold Job Shop

—Makes Variety of Castings



This double dump box shell molding machine incorporates a common curing oven, enabling two men to make shells on alternate cycles

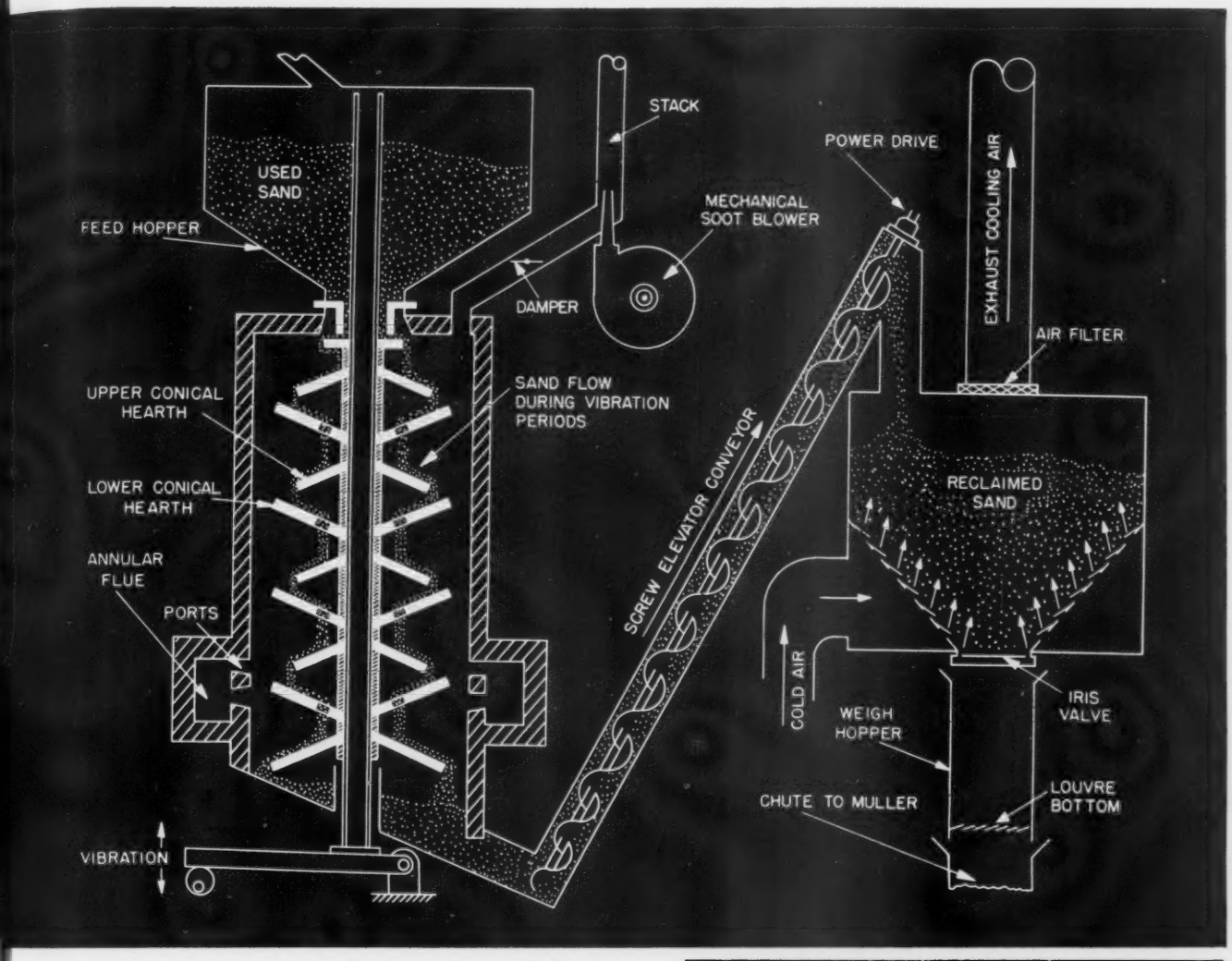
SHELL-CAST Alloys Ltd., Guelph, Ont., started in business about 4 years ago with half a dozen employees, a floor area of 1500 sq ft and an order for gray iron shell mold castings. Today, with an employment of 42, 33 of whom are production workers, it is producing a wide variety of castings in alloy steels, gray and nodular iron, bronze, brass, aluminum, and magnesium on a jobbing basis in its modern, mechanized shell mold foundry. Current operations are conducted in a new building, completed late in the spring, and covering ten times the original floor area. Much of the equipment used in the foundry is unique in its principle of operation and was designed by President R. S. L. Andrews.

Sand Is Reclaimed—The reclamation unit is installed in a tower having three floors, and consists of a 5-ton feed hopper mounted over the reclaiming furnace, an inclined screw elevator, and a 5-ton surge bin and weigh hopper. A sand muller on the second floor is located immediately beneath the weigh hopper.

The cylindrically shaped furnace has an annular flue around the bottom third section. Passing up through the center is a hollow steel pillar on which conically shaped heat-resistant iron hearths are mounted. At the top is a flat feed plate which prevents sand from flowing continuously from the 5-ton feed bin into the furnace. The pillar assembly is mounted on an oscillating device. Oscillation is in a vertical plane and is variable between 0.030 and 0.125 in. A simple timing cam permits on-off oscillation. Hot gases enter the annular flue from a precombusion chamber fired by a low-pressure, gun type burner fitted with a metering device. This metering device is controlled by thermocouples in the furnace walls, and operating temperature is maintained at 1125° F $\pm$25° F.

With the furnace up to operating temperature, sand is fed in by turning on the timing unit. During oscillation, sand flows from the feed bin onto the center of the first hearth, out to the edge, and down onto the outside of the second hearth. When oscillation ceases sand lays on the hearths. Hot gases continuously pass over the sand as it lays on the hearths, and resin on the sand grains is reduced to carbon which is carried up through the exhaust stack along with the gases.

Reclaimed sand collects in a chute at the bottom of the furnace. Its temperature at this point is around 800 to 900° F. This chute feeds sand into a rotary screw conveyor which raises and dis-

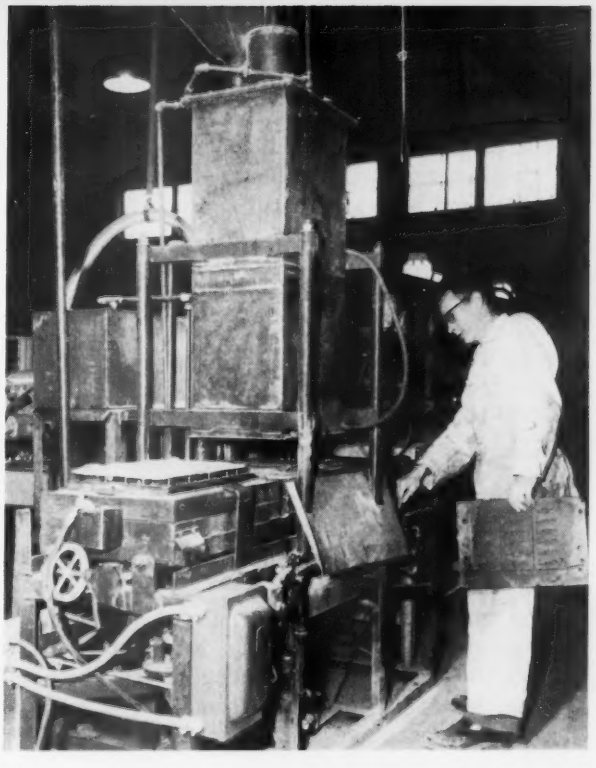


Diagrammatic sketch of the continuous reclamation unit which handles 1850 lb of sand an hour

charges it into the 5-ton surge bin over the weigh hopper. Hot sand in the surge bin has cold air blown through it at 2000 cfm, 6 in. water gage. Sand temperature at the surge bin discharge is recorded continuously by thermocouple and controlled at 140° F max. Up to this point the equipment processes sand at the rate of 1850 lb an hr.

Sand is discharged from the surge bin into a batch weigh hopper. Each batch, containing 3 cu ft, is dumped into the muller, where it is mixed with 3 to 5 per cent resin for molds or 0.9 to 2.5 per cent for cores. The resin is not 100 per cent solids and is modified by the manufacturer to meet the special requirements of Shell-Cast Alloys' molding technique. After 30 to 40 seconds mixing time, hexamethylenetetramine, a catalyst, is added to the mix in the proportion of 10 to 15 per cent by weight of resin content, and mulling continued for an additional 4 to 5 minutes. The catalyst is added as an aqueous solution consisting of 1 lb Hexa to one gal water.

Sand-resin mix is discharged from the muller to a mobile, screened funnel hopper having a louvred bottom and a vibrator actuating the screens, the



Two-station shuttle machine turns out shells or cores by a dump-blow method of investment. It produces shells at the rate of 50 to 60 an hour

smallest mesh screen being No. 40. The mobile hopper is positioned over any one of three grated openings in the floor and on opening the louvres, the mix drops by gravity into a particular 10-ton storage bin. An air-actuated iris type valve at the bottom of each bin releases sand as needed to a 2-in. pneumatic conveyor pipe and is blown to hoppers over the automatic shell mold and coremaking machines and to hoppers in the hand-operated shell and coremaking sections.

Molding Operations—A double dump box shell mold machine is located at one end of a rectangular room housing molding, coremaking and casting cleaning operations. The machine is equipped with two rollover and one common electrical resistance rod heated ovens to perform the investment and curing cycles. The insulated rollover ovens are mounted on hollow shafts in trunnion bearings. The shafts carry compressed air lines for mold ejection and electric power leads. Two patterns are clamped to the open top of each rollover oven and thus form the major heat conduction path.

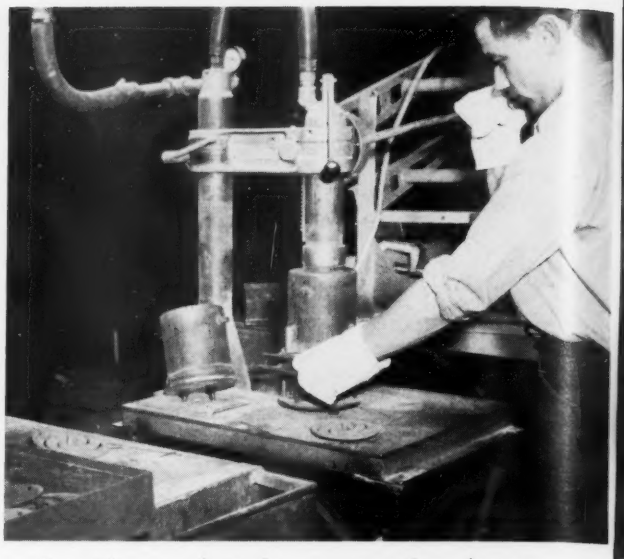
Heating elements raise pattern temperature to 450° F at the instant of investment. Pattern temperature drops 15-25° F over its entire surface when sand-resin mixture is deposited. Therefore, based on an operating cycle of 2 minutes elapsed time between alternate investments on each rollover oven, heat input to the patterns is arranged to give a rate of temperature rise of 10° F a minute.

To achieve standard thermal characteristics on all patterns, regardless of contour, simple heat-exchanger devices are incorporated in the underside of the plate which pick up heat from the rollover oven and feed it to the high, thin projections of the pattern. Mr. Andrews believes that the thermal condition at the instant of investment has a direct bearing on dimensional accuracy of the finished casting, and that pattern design must be integrated with automatic shell mold procedures if bulk production of precision shell castings is to be achieved.

One man operates each of the dump boxes on the double box machine, and each produces 25 to 30 complete molds per hour. Shells measure 24 x 36 in. The shells are broken into four parts to produce two complete molds measuring 12 x 18 in. A two-station shuttle machine having heating arrangements based on the same principle as the rollover machine produces shells or cores by a dump-blow method. This machine produces at a rate of 50 to 60 units an hour and is operated by one man.

The dump-blow method of pattern investment is unique. The accompanying schematic sketch shows the investment chamber on the machine. A funnel-shaped blowhead resembles the sprinkler head on a common garden watering can. The blowhead also acts as a valve to release and stop the flow of sand-resin mix to the pattern.

As the blowhead is raised, sand mix falls from a water-cooled chamber to the pattern in the first phase of investment. When it is lowered to close the chamber opening, air at 100 to 120 psi is released through the pipe. Because of the blowhead design, air is directed throughout the lower chamber and develops uniform pressure over the top surface of the sand mix. The ramming effect thus achieved forms a dense shell over the pattern.



Core blower, adapted to use coated sand, produces hollow or solid cores in heated boxes

Loose sand mix is forced out of the lower chamber and up the exhaust channels to the top chamber ready to be dumped on the next pattern. The channels also relieve air pressure in the lower chamber. At completion of the investment cycle, the invested pattern is lowered from the dump-blow chamber and shuttled to the side as the second pattern comes into position under the blowhead.

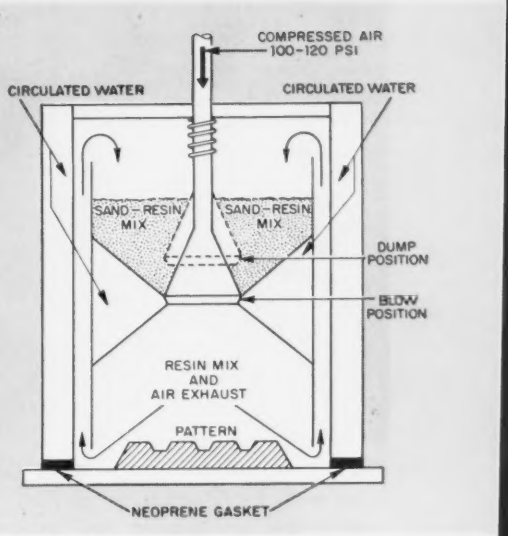
All patterns and coreboxes for hand or machine use are constructed from standard die plates, pressure plates, ejector pins, and guide parts, in either gray iron or hot-rolled steel.

Extruded Ready-To-Use Cores—The coreroom is located in an area between the cleaning and molding sections. It is equipped with a row of benches on which molds for special, short-run jobs and cores are hand-made. One core blower adapted to the use of bonded sand also is used to make hollow cores. Such cores are made simply by turning over the blown corebox to remove excess sand. Patterns and coreboxes are heated and shells cured under two electrical resistance rod hoods mounted on balanced arms so that they can be swung into position and out of the way as needed.

Several sizes of rod-shaped cores are used, and they are produced by a regular core extruding machine. It is adapted to the use of coated sand by a special electrically heated extrusion die about 10 or 12 in. long. Thus, curing takes place as sand-resin mix is pushed through the die. The continuous, finished core coming out the machine is broken or sawed to the lengths desired.

Molds Are Assembled—Shell halves are placed

Operators at benches along a belt conveyor set cores and close mold halves with liquid resin



Schematic sketch of the chamber for dump-blow pattern investment on the shuttle shell machine

on a 20-in.-wide heat-resistant rubber sliding belt conveyor about 30 ft long. Assembly operators at seven benches along one side of the belt remove the shells for coring and closing on spring-loaded pin machines designed to close two standard sizes of molds, 12 x 16 and 16 x 24-in. The pins are placed so that only the peripheries of the molds are clamped at the time of closing. Liquid resin, dispensed from a plastic bottle, is laid around one half of a hot mold as it rests in the machine, and any necessary cores are placed in position. The other hot mold half then is placed on top and the machine closed by air cylinder.

According to Mr. Andrews, finning is reduced and dimensional accuracy across the parting line is improved by not putting bonding resin on the inner parting faces of the molds. These benefits also result in part from the subsequent procedure of magnetically compacting back-up shot prior to pouring.

After 30 seconds the mold is removed from the closer and put back on the sliding belt conveyor to be unloaded at the end, either to wheel-mounted storage racks or to metal boxes on a gravity roller conveyor pouring loop mounted at floor level. Mold shop schedules are a day ahead of the melt shop and the melt shop is a day ahead of the cleaning shop.

All molds at Shell-Cast Alloys are poured vertically in steel-sided boxes of three general sizes—14 x 16 x 16 in. high, 12 x 24 x 16 in. high, and 12 x 36 x 24 in. high. Molds from storage racks, or directly from the mold conveyor, are set on edge in the boxes which have aluminum bottom plates extending 2 in. on either side. The plates reduce wear on conveyor rollers and do not interfere with the magnetic fields of the shot compactor.

Shot Compacted Magnetically—When a box has its quota of molds, which may be one to seven depending on the height of the mold cavities, it is pushed along the roller conveyor to the back-up station at one end of the loop. Shot loading is done in a metal enclosure about 6 ft square. A cone-bottom hopper, holding 7 of the 12 tons of steel shot in the system, forms the top of this enclosure, and a recuperative hopper leading to a bucket elevator forms the bottom. A bridge supports the roller conveyor and a grating over the recuperative hopper holds the operator's seat.

Spilled shot drops through the grating and is returned to the top hopper by the bucket elevator. Boxes pushed into the enclosure through an opening in one side are positioned over an electro magnet set flush in the conveyor with a row of short rollers on either side which carry the weight of the boxes, leaving an air-gap of 0.030 in. between the aluminum bottom plate of the box and the pole faces of the magnet.

An operator, seated inside the enclosure, puts sponge-rubber bungs in the pouring basins of the shell molds, spaces them evenly in the box and opens a gate valve to drop shot into the box. At the same time he switches on alternating current at 220 v, 100 amp to the magnet. The change in polarity of the magnetic field at 60 cycles per second, a characteristic of alternating current, causes vibration of the shot and packs it solidly around the contoured backs of the molds.

When the box is filled, in about 8 to 10 seconds, and the top leveled-off, the operator switches off the alternating current and momentarily turns on direct current at 220 v, 150 amp for 10 milliseconds. This surge magnetizes the steel shot and locks it solidly around the molds. It does not force the mold halves together any tighter but it does hold them in their original assembled position against the head of molten metal.

This is important, especially with heavy section castings weighing over 25 lb. For no matter how well a shell mold is bonded at the parting surfaces, if it is poured off unsupported, casting cavity faces on both sides of the parting line are free to distort under the influence of forces which

Molds, set in boxes, are backed up with shot, which is magnetically packed against the molds

Molds are poured on roller conveyor spurs under hoods. Note heat shield on the ladle carrier

Castings are tossed from shakeout to tote boxes

are exerted on them by the molten metal head.

Stoppers are removed from the pouring basins and the boxes are pushed from the shot back-up station to a switch in the roller conveyor, consisting of a square steel plate in which ball bearings are embedded. Seven such switches spaced along the pouring side of the conveyor loop permit boxes to be rolled off the loop to short sections of roller conveyor on which pouring is done. Each of the spur tracks is hooded. Ladles are brought to these seven pouring areas on short sections of overhead monorail conveyor, which are spurs off the main monorail loop. Melting furnaces are placed along this loop in a line opposite the ends of the pouring conveyor sections.

As the metal cools in the mold, heat dissipated through the shell reaches the magnetized back-up shot so that by the time a solidification skin has formed on the casting the shot begins to demagnetize. At shakeout, demagnetization has reached the stage where shot can be handled in the conveyors which return it to the mold back-up station.

Workmen push cooled molds from the spurs back to the roller conveyor loop and to the shakeout at the end of the loop opposite the mold back-up station. Boxes are rolled, one at a time, onto a switch at the end of the loop. An air cylinder arm pushes each box to a tipping section of roller conveyor equipped with flanges which engage the extended bottom of the box. The entering box pushes an empty box off the tipping conveyor section for movement back to the loading area. Through pushbutton control of an air cylinder, the shakeout operator tips the conveyor section to dump contents of the box to a hooded shakeout. Three or four fabricated rubber door mats cover the shakeout deck to prevent damage to casting surfaces.

Separate Shot and Sand—Shot and sand fall from the shakeout through a stationary screen to a screw conveyor and are fed to a rotating, cylindrical screen. Shot rolls out the end of the screen to an oscillating conveyor which feeds the bucket elevator for final discharge of the shot in the bin over the mold back-up station.

Sand passes through the rotating screen to an oscillating conveyor to be dumped over a magnetic separator into a hammer mill. From here the sand goes by bucket elevator, to the feed bin above the sand reclaimer.

An operator hooks castings off the shakeout to front-dumping tote boxes mounted on wheels. Pieces of shell molds are taken off the shakeout and from the screen below the shakeout with a rake and shoveled into a chute leading to the oscillating conveyor feeding the hammer mill.

Tote box loads of castings are wheeled from shakeout to the cleaning room by hand. Operators use hammers to knock gating metal off gray iron castings. Gates on nodular iron, aluminum and bronze castings are removed by band saw or abrasive wheel saw and sorted into separate tote

Tote-box loads of castings are wheeled from shakeout to the cleaning room by hand. Powered equipment in the cleaning room is equipped with exhaust systems

boxes for movement to the melting department. Castings are rolled between cleaning operations in wheel-mounted tote boxes. A wet blast machine and three double-end grinders handle castings cleaning. All powered equipment in the cleaning room is equipped with exhaust systems.

Additional cleaning room equipment includes two rows of benches where metal which can not be ground off is removed by hand-dressing. Three power drills are available for reaming out close-tolerance bores and for tapping small holes.

Metal Melting—Molten metal is supplied by eight furnaces to meet the requirements of production-jobbing flexibility and metallurgical purity. Two of these are hydraulically tilted, 12,000 cycle, electric induction furnaces, one of 50 lb in 20 minutes capacity, the other of 100 lb in 45 minutes. They handle nickel and cobalt alloy steels for specialized applications. Two oil-fired, air-cylinder tilted reverberatory furnaces, each having a capacity of 1200 lb in 40 minutes, are used for nodular, alloy and gray irons.

Four conventional crucible furnaces supply molten nonferrous metals. All of them are capable of melting aluminum alloys at 300 lb an hour each. Two of them also will melt brass and bronze at 300 lb an hour each. The other two are fitted with back flues and safety hoods for melting magnesium in steel-pot crucibles at the rate of 200 lb an hour each. Exhaust hoods service all melting equipment.

Laboratory Facilities—Facilities include equipment for ferrous and nonferrous chemical analysis, physical testing, and for photographic work. Additional instruments are included for dealing with problems peculiar to shell casting. X-ray facilities are available at a local steel foundry.

Air Conditioning—All production areas are fed with forced air, 40 per cent recirculated with 60 per cent fresh outside air added, at a rate of 30 complete air changes an hour. Fumes and gases resulting from mold and core making, metal melting and pour-off are drawn off by hoods and ducting to the outside. The system supplies cool air in summer and warm air in winter so as to maintain working conditions at 70 to 80°F.

Cast parts produced by the company are classified by standard of surface and dimensional accuracy:

Class 1—All machining operations eliminated. Finish better than 150 microinches.

Class 2—All rough machining operations eliminated. Finish better than 250 microinches.

Class 3—No machining operations eliminated. Finish as specified by customer in microinches.

In this way management has found that misunderstanding as to the degree of precision to be expected when bulk production commences is avoided and the customer is able to judge more accurately the value of the product he is buying.

Company products include main, connecting rod, and wrist pin bearing bushings in 80-10-10 bronze for marine use, water pump closed impellers in silicon bronze, quadrant scales in "M" bronze, fire hose couplings in "B" bronze, rotor end rings in 99 per cent pure copper, and radar wave guide bends in aluminum alloy.

Gray iron castings include electric motor brackets, housings, bearing inserts and explosion sleeves; washing machine gear wheels, cases, covers and connecting rods. Sheave covers, stator rings and claw hammer heads are cast in nodular iron made by the cerium process.

Editor's Note—Certain of the processes and constructions described and illustrated in this article are covered by letters patent or an application for letters patent. Shell-Cast Alloys Ltd., the publishers and/or the author assume no responsibility for damages arising out of patent litigation or suits involving any process or apparatus described in this article.

Economics of . . . BRASS FOUNDRY

In the seventh of his articles on The Brass Foundry, Mr. St. John points out that accurate cost information and control determine over-all profit

A DICTIONARY definition of economics: "The science treating of the production, distribution and consumption of goods and services." Economy: "Thrifty management."

Possibly there has never been a time when science and thrifty management in the brass foundry were so important as now. To competition within the industry has been added competition with numerous other methods of producing parts formerly made in the foundry exclusively. Sinterings, forgings, screw-machine products and molded plastics have taken over a substantial fraction of the casting market. To meet this competition the foundryman needs, more than ever before, accurate cost information and control.

It is not the intention here to discuss foundry cost accounting in detail. That has been done elsewhere, such as in *Basic Cost Principles for Nonferrous Foundries,* published by the Non-Ferrous Founders Society. See also "What Does a Casting Cost", FOUNDRY, January, 1955. Our present purpose is to show how the accountant's figures can be put to work to reduce foundry costs and to arrive at an equitable basis for setting prices and calculating profit and loss.

Large foundries have full-time cost accountants and statisticians. In any organization, no matter how small, there must be someone to play this role. Cost information must be gathered, analyzed, summarized and put before management in a form which will enable the latter to make correct decisions and formulate wise policies. The elimination of wasteful practices, discontinuance of unprofitable products, purchase of labor-saving equipment and the setting of prices at a profitable and competitive level—all are dependent on reliable information correctly interpreted.

Where the Money Goes—The foundry spends its money in the following ways.

1. Metals and any other materials which actually become a part of the finished product.
2. Direct labor.
3. Indirect labor.
4. Supervision and clerks.
5. Supplies and hand tools.
6. Maintenance labor and repair parts.
7. Interest on inventory; metal, supplies, work in process and finished product.
8. Interest on capital investment and depreciation on buildings and equipment.
9. Insurance and taxes.
10. General administration, including cost of sales, engineering and miscellaneous items of expense.

The relative value of these items will vary largely from one foundry to another, depending upon size and nature of organization, but all are important in every foundry. Only the first two items—metal and direct labor—are classified as direct expense; all others come under the head of burden, or overhead. For the most part, we shall leave to the accountant the manner in which cost information is to be gathered and summarized. That is his expert function. But the interpretation and application of this information is management's problem, and a very puzzling problem it is at times.

Except when governed by definite chemical specifications for his castings, the foundryman is free to select the alloys he wishes to use. Economy dictates that the alloy chosen for any job be the least expensive which will serve the purpose. It does not follow by any means that the lowest cost per pound at the furnaces will result in the lowest cost per pound of finished castings. Excessive scrap losses, melting loss or low casting yield may wipe out the expected saving.

On the other hand, a small addition of another metal may promote an inexpensive alloy to a stature comparable with a considerably more costly one. Take, for example, the use of 1 or 2 per cent of nickel in the red brasses. This is a matter worthy of the most careful study which will be considered in a future article. At this point we wish only to indicate that first cost is not necessarily the ultimate answer.

Direct or Indirect?—Where does one draw the line between direct and indirect labor? This is important because the accountant commonly uses the direct-labor hour as a basis for allocating burden dollars, while management draws conclusions, sometimes fallacious, from the ratio of indirect to direct labor. In the foundry proper, the molder is commonly accepted to be *the* direct laborer. Coremakers in the coreroom and grinders in the cleaning room may be classed as direct labor. Another group, such as melters and pourers in the foundry, is sometimes termed processing labor and used as a burden basis.

In an effort to establish in advance what direct-labor costs will be, the concept of a "standard hour" has been widely adopted. For this purpose, for any particular product, each operation is studied to determine how much production can normally be expected from one man-hour, based on experience or on time study. The rate of pay is set so

OPERATION

By HARRY ST. JOHN
Foundry Consultant

as to offer the operator an incentive for not falling below standard, with possibly a bonus for reaching a higher level.

Another method is to pay the molder, for example, so much per 100 molds, having established a suitable figure by time study or from standards based on a series of time studies. In this way incentive is at a maximum and it is expected that the exact cost of direct labor for any product can be calculated in advance. None of these methods works out as well in practice as they do on paper. For example, it is often difficult to determine to what extent an individual operator is responsible for defective work and what proportion of the calculated cost will have to be paid for bad castings. However, the use of standards and incentive pay do represent a great advance over previous flat hourly-pay practice.

Indirect labor is of two kinds, which may be called variable and semivariable. Unless the foundry is very small, certain types of labor are completely variable in the sense that the number of men can be varied in exact proportion to the volume of product or the number of molders employed. This is true of the men who handle metal, molds or castings. In other cases increases or decreases have to be made by steps. At a given level of production there may be too much work for two melters but not enough to keep three fully occupied. This points up the importance of planning production by step levels so that the proposed production is enough to keep all needed employees profitably busy. In a few cases indirect labor may be invariable. For example, the attendant of a mechanized sand system must be at his post whether he is serving twenty molders or six.

Useful standards can be set up for indirect labor so that at any level of production the number of men needed for each job classification is known. Absenteeism is an unpredictable obstacle. If enough men are provided to take care of maximum absenteeism there are likely to be idle hands on many days. If fewer men are employed, production will frequently fall below the desired level. Payday and the following day commonly illustrate the two extremes. A carefully planned middle course seems the best solution, coupled with discipline or discharge for chronic offenders.

Supervisory Cost Fixed—Responsible supervision is a fixed cost. The foundry boss has to be on the job if castings are being made no matter how low the rate of production. Presumably he is a man whom management would prefer not to lose. Clerical help and the lower ranks of supervision can be classed as semivariable, people who could be dispensed with if production reaches a low level. On the other hand, these people are the ones from whose ranks foundry foremen and even managers should ultimately be recruited. The forward-looking manager will hesitate to lay off trained personnel which may have to be replaced at considerable expense at a later date. Some individuals he will certainly consider fixed, although he will take the opportunity to get rid of "weak sisters."

Supplies and tools are completely variable, but the cost of maintenance labor and repair parts is a semivariable expense which should be kept in line with *average rate of production* over an extended period. Failure to do so is sometimes due to an attempt to synchronize maintenance expense with rising and lowering rates of production. So far as possible, maintenance men should be employed year in and year out on a basis of annual production. When production is at a low ebb, the time is ripe for major repairs, moving machinery and other time-consuming projects. When every machine is needed for production, interruptions for repair work are costly and not likely to be undertaken except in case of actual breakdown. But if repairs have been neglected during slack periods, breakdowns are certain to occur during busy periods. It may be added that good maintenance men should not be labeled expendable.

Discusses Maintenance of Inventories

The operating man hesitates to argue with the accountant about the cost of maintaining an inventory. The purchase of metals and supplies at favorable prices should be coupled with a question as to how long these materials are likely to be in stock before they can be used. Surplus of finished product in the bins can be a heavy item of burden expense. On the other hand, in a competitive market, the ability to make quick delivery of unforeseen orders is important.

In the desire to keep product inventories low, one point frequently is overlooked. Fluctuations in the rate of foundry production result in an expense which is hard to measure and can be higher than is commonly realized. For one thing layoffs hurt the morale of the working force. Even more serious is the cost of shifting men to unfamiliar jobs and, when production again increases, the cost of hiring and training new men. It is often cheaper to pile up inventory, if its eventual sale is assured, than it is to hire and fire. Of course, if labor contracts involving unemployment pay and the so-called guaranteed annual wage become the usual thing, the importance of maintaining a uniform level of production can no longer be ignored.

Getting Maximum Production—The rapidly increasing cost of labor has emphasized the necessity for getting the highest possible production from each man-hour. Incentive plans are good but they have their limitations. In the main we have to

depend on labor-saving equipment— mechanical devices which enable one man to do the work of several. The costliness of such equipment presents a difficulty. When it stands idle, the cost result is much the same as if we were paying men to stand idle. Discriminating judgment and a good deal of foresight are needed if this element of burden is to be kept within reason. Obsolescence is a factor not to be overlooked. It isn't just a question of how soon will the machine wear out but how soon will there be something so much better that one cannot afford to run the old machine.

Control of the last two items on the list are outside the scope of this article. Insurance, taxes and administrative overhead are unavoidable expenses which receive close attention by management and the accountants. The manner in which they are allocated in determining the cost of individual castings does have a bearing on our present subject.

Every Casting Has Individual Cost

Every foundryman knows that the cost of making a casting is individual to that casting, none exactly the same as any other. At a competitive price some castings are more profitable than others and some can be definitely unprofitable. In any case, by far the largest part of any casting's cost is its share of the plant's burden. The problem is to determine what that share should be.

When we examine the makeup of burden, we find that, like certain classes of personnel, it can conveniently be divided into three categories. A portion of it may be termed variable, meaning that it can be increased or decreased directly with production. This includes supplies and certain types of labor. Another portion is semivariable, partly controllable with respect to production, but not entirely so. This includes other types of labor, supervision and clerical help. The remainder is fixed expense which remains the same regardless of production. This covers depreciation, interest, insurance, taxes and administrative costs.

If we use direct-labor hours as a basis for applying burden against our various products and include as direct labor those types of work commonly classified as such, we find that our over-all burden can hardly be less than 250 per cent. That is, for every dollar we spend for direct labor we spend $2.50 for burden, or overhead expense. Using the burden breakdown suggested above, we may find something like this: Variable 90 per cent, semivariable 60 per cent, fixed 100 per cent.

If we now examine our different products, one by one, charging to each its direct expense, plus its full share of burden, we may discover one or more which we are producing at a loss. Should such an item be discontinued, or, in order to satisfy a good customer, purchased for resale from some other foundry willing to sell at less than our cost?

You Can Go Too Far—Possibly a modern fable will help to answer the question. Once there was a foundry which made 12 different items at a reasonably good over-all profit. A cost study revealed that these 12 items varied all the way from very profitable to little or no profit. One, No. 12, actually showed a loss and was therefore discontinued. Its share of the variable burden and half the semivariable was saved; the rest of the burden now had to be divided among the 11 remaining products. This added burden proved too much for No. 11, which previously had shown a small profit. It seemed best to drop No. 11. So it went until finally only No. 1 was left. This casting had once been very profitable but, with all of the burden to carry, it could no longer make ends meet and had to go the way of the others. So, at the end—an appropriate word—only burden was left.

Actually, it would seem that burden should be figured two ways. First, by the conventional method, in which each product is allotted its full share. This will put the figure on the weak items and perhaps, once they are known, something can be done to improve them. If the staff and facilities of the foundry are fully employed and seem likely to remain so, perhaps unprofitable products should be dropped or farmed out. Otherwise, any item which shows a modest profit, after being charged with its variable burden and half of its share of semivariable, should be continued until something better can be found to take its place. In other words, it pays to keep men and facilities busy provided an over-all profit can be shown.

A jobbing foundry, not fully occupied, can afford to ignore its fixed overhead when bidding on a new job. Smart jobbing foundries do just that.

Production per Man-hour Is a Variable

The use of the direct-labor hour as a basis for allocating burden has disadvantages. The amount of production per man-hour is itself a variable, depending upon efficiency of the workmen and subject to change when improvements are made in equipment or methods. It would be better if some unit of product, or material entering into the product, could be used as a basis such as hundredweight of castings or hundred-weight of metal melted. However, an attempt to do this leads to complications which have so far prevented the adoption of such a practice.

For calculation of burden for burden centers—common practice in large concerns—can also have misleading results. For example, consider a large core-blowing section, making a variety of work, as a burden center with a common burden rate charged to all cores made in the section. The rate in a core-blowing section is likely to be high and will penalize items made in simple boxes, which are inexpensive to maintain and replace. Other cores, made in intricate boxes, will show too low a cost in proportion to the expense involved in their upkeep. Furthermore, there is no direct relationship between the production per man-hour and the quantity of sand and binder used.

It is evident that the calculation of burden rates and their application to products are sometimes oversimplified, with unpleasant results. Whatever method one may prefer to use, the important thing is not to lose sight of those factors which in the end determine whether or not the foundry makes an over-all profit.

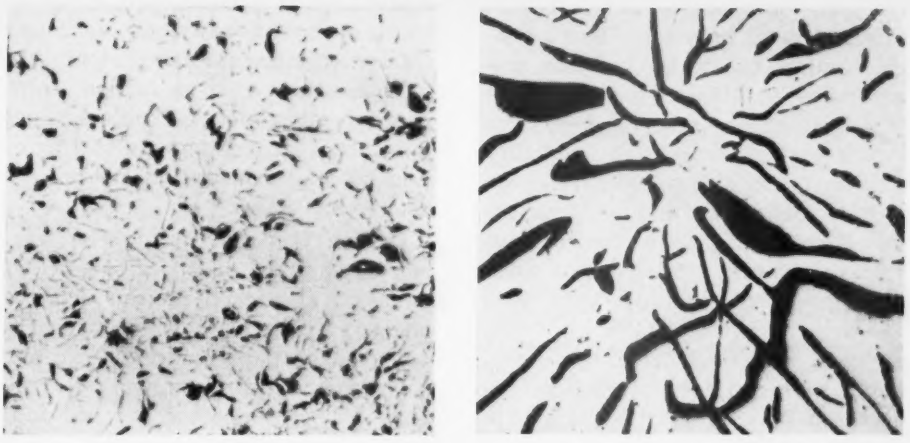


Fig. 1—In unetched microspecimens, specimen A, on left, was cooled fast and shows small graphite formation. Specimen B, right, was cooled slow, shows large graphite

Sampling Iron for Carbon Determination

Discussion of direct combustion method of carbon determination in iron and steel stresses the importance of using correct sampling procedures

By WILLIAM B. SOBERS
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DURING the eighteenth century rapid chemical advances were made, but it was not until late in the nineteenth century that analytical chemistry found general acceptance in the iron and steel industry.

In 1797, C. J. Vauguelin analyzed some steel samples by methods devised by Bergman (1735-1784), and credited him with having first outlined the methods for carbon, silicon and phosphorus. Vauguelin presented the analyses after much difficulty and many troubles. At a later date (1806), when analyzing irons, he also found manganese, chromium and aluminum, and remarked about the smell during solution, saying that it cannot be wholly due to phosphorus, but he did not mention sulphur or hydrogen sulphide. However, in 1803, Vauguelin, in analyzing meteorites mentioned sulphur.

Papers were published as early as 1805 by M. J. Roziers and 1806 by J. Black, stating that sulphur made steel red short and phosphorus cold short. However, it was nearly a century later, following the development of the microscope, before a satisfactory explanation was accepted.

Before chemical analysis had been introduced, metals were classified by simple mechanical tests. Early methods of analysis were so slow that chemistry was of no value in controlling composition during melting. Eventually, analysis methods became rapid enough to permit chemical control test before tapping the molten metal. This progress has resulted in a lower percentage of "off analysis heats," and a lower over-all cost in the production of wrought and cast metal parts.

The physical qualities of ferrous metals are influenced by chemical composition. As a result, the foundry or plant chemist and metallurgist are closely aligned in their work. Specifications are set up with the end use of the material in mind, and elements regarded as impurities for one particular application are often desirable in others.

With the development of special irons and steels for new applications, chemical control will become more important in the future for successful foundry operations. The modern trend is away from older wet methods and toward instrumental and colorimetric analysis. Many plant laboratories now include a spectrograph in their equipment, the lat-

est development being a direct-reading type.

Types of Analyses—Two types of analytical work are used in the metal industry. First, control work which requires the testing of raw material to determine whether or not it meets specifications; also for melting and other process controls as a quantitative means to produce quality castings. Second, analyzing the work of research workers in order to *determine* and *confirm* the results of a project which may have required several months or years of work. This type of work often requires variations of apparatus and methods.

Through the years, improved chemical control has made possible new concepts of design, engineering, construction and processing. In addition, foundries and steel mills producing alloy irons and steel are able to conserve and prevent wasteful use of critical alloys through chemistry.

Chemistry is also responsible for a better understanding of the physical properties of irons and steels in use today. As a result, we are in a better position to select and control the correct metal for consumer items, designing and engineering them to insure value, safety and consumer satisfaction, and at the same time sustain a profitable and successful plant operation.

The word "routine" should be stricken from our vocabulary of terms used in the metallurgical and chemical laboratory. In its place we should use the word "control." We all know that control is essential to successfully operate a metallurgical plant or foundry, for both quality and cost of product. Advancements, improved methods and new ideas will come from those who think in terms of quality control, not from those who believe they are doing routine work.

Importance of Sampling—Sampling of ferrous material for chemical and spectrochemical analysis is very important. To take or prepare a uniform representative sample requires skill and judgment which often is not recognized. This is particularly true when elements are present that do not go in solid solution, such as carbon, sulphur and phosphorus. An element like carbon may also be affected by heat treating and casting conditions. Besides normal segregation, inverse segregation may also be a problem.

Carbon Control—During the last 100 years or more, we have had several methods for determination of carbon in iron and steel. These include seven or eight wet chemical methods which are obsolete today, with the exception of Eggert's color method for combined carbon developed in 1862. Eggert's method is based on the theory that iron carbide (Fe_3C) dissolved in dilute nitric acid gives a brown color proportionate to the amount of combined carbon present. However, this color is also affected by various heat treatments and alloys even though the alloys are present in a residual amount. As a result, the method finds very little use today.

Fig. 2—Cast from same ladle, three test bars ½-in. in diam were heat treated to contain variable amounts of combined carbon as spheroids. Bars were turned down to ⅝-in. in diam then shaped to 5/16-in. half rounds, and half-disk samples were cut

We also have several semiquantitative methods, some of which have been used from the early history of iron and steel and are still used today—such as the fracture test, spark test, hardness and microscopic examination.

It was Sorby who, in 1863, was telling the iron and steel industry for the first time what he saw in the microscope. Some of his steel specimens required several days to hand polish, compared with minutes using modern methods. As a result, his pioneer work in metallography, together with chemical control, have made possible development of modern alloys, methods of fabrication and elaborate heat treatments. Metallurgy became scientific, gradually dispelling older fantastic ideas.

A more recent development and rapid method

for checking carbon samples of steel during the melting period is the portable Carbanalyzer, which measures the relationship between the magnetic properties and carbon content.

However, the method which has fulfilled all the requirements and advancements of modern metallurgy has been the direct combustion method, that is, oxidizing the sample in a stream of oxygen at temperatures from 2000 to 2600°F, depending on nature of sample and type of material.

Early gas-fired combustion furnaces (Fletcher furnace) were designed originally for dental work, and modified for iron and steel analysis. One of the first patents covering the electric combustion furnace was issued to W. M. Carr in 1902, patent No. 699,146. Platinum wire was used in some of these early furnaces. However, Dr. Charles Morris Johnson, formerly chief chemist of Crucible Steel Co. of America, was among the first to develop and publish his work, using the electrically heated combustion furnace. Dr. Johnson also made several other contributions to the industry in the way of new equipment, alloys and methods of analysis.

Combustion furnaces using silicon-carbide rod elements in place of metallic wire to heat the furnace appeared in the late twenties. Later came the development of special wires for the heating element; these had a longer life and could be operated at higher temperatures than the nickel-chromium wire most commonly used at that time.

Several years ago the author developed a new type of combustion furnace called the Sobers vertical type (patent No. 2,332,943; 1943). It was the first furnace to employ the combustion tube in the vertical position and to use crucibles in place of rectangular-shaped boats to hold the sample.

All rubber connections are eliminated from the combustion tube. The bottom end is sealed with a trap containing low melting alloy together with some compressive pressure of the trap against the bottom of the tube. The reduced top end is made gas tight by flaring the end of a piece of copper tubing and slipping it over the reduced end of the combustion tube. This connection is made gas tight by spraying with metallic zinc. A rubber connection is then made on the other end of the copper tubing several inches from the hot combustion tube. The combustion tube is 22 in. long and 1¾ in. ID.

For simple operation, a solenoid valve, electric timer and buzzer are used to automatically control oxygen flow and time cycle. All carbon determinations are run in a three-minute cycle, compared with 7 and 15 minutes for the older method using a rectangular-shaped boat lined with 90-mesh alundum. This shorter period is made possible by the more compact sample and lighter mass entering the combustion tube. As a result, the compact sample in the crucible benefits more from the heat of reaction during oxidation of the metallic sample to the oxide, permitting a shorter time period per determination. Disk samples, slugs and shot are easy to handle in the round crucible.

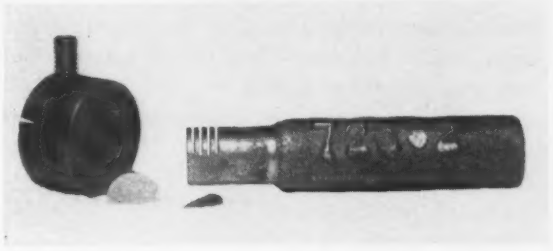


Fig. 3—Illustration shows the type of slotted die or collar that may be used to make samples

Rapid carbon determinations have been common practice in the metal industry for the last 15 years. High-temperature furnaces, operating in the horizontal position, use a small rectangular-shaped boat without alundum to make this shorter time cycle possible. This also includes sulphur determinations by the hot tube method.

The most recent type of combustion furnace is the high-frequency induction furnace. This furnace is designed to operate with the tube in the vertical position and uses crucibles as sample containers. Working temperatures of approximately 4000°F may be reached momentarily within several seconds after turning on the power.

Sampling of Gray Cast Iron—We may assume the cross-sectional area of gray iron, with the exception of the as-cast unground or unmachined surface, to be chemically homogeneous in respect to total carbon. However, it may vary considerably in the amount of graphitic and combined carbon present in various areas of the same casting, due to cross-sectional size, speed of cooling and chemistry.

It is important in sampling of gray iron that suitable precautions be taken to collect all the drillings—fine as well as coarse particles. Since particle size segregation takes place in respect to carbon, the problem of securing a representative sample for carbon determinations is a factor. Microstructure of the metal plays an important part in determining the amount of graphitic carbon segregation that may be expected in preparation of a sample. To reveal this, two different size test specimens, *A* and *B* were poured from the same ladle, containing 3.74 per cent total carbon. Approximately 100-gram samples were drilled from each specimen at the same speed, using a ¼-in.-diam twist drill.

Specimen *A* was 4 x 1½ x 1½ in. and weighed approximately 2.5 lb. It was cast in an open sand mold so it would have a matrix of small graphite and fine pearlite near the top area, which was exposed to air cooling. This specimen then was drilled in the air-cooled area.

Specimen *B* was 8 x 4 x 4 in. weighing about 28 lb. It was cast in a sand mold and allowed to cool in the mold overnight before shaking out. Specimen was drilled longitudinally at the center

after discarding the first inch of drillings.

The following sieve analysis was made on the material as drilled, revealing the degree of carbon segregation that took place in respect to total carbon and graphitic carbon.

	Specimen A	Specimen B
On 20 mesh	3.74% T.C.	3.56% T.C.
On 40 mesh	3.70	3.41
On 80 mesh	3.63	3.39
On 300 mesh	3.44	3.39
Through 300 mesh	4.06	9.30
Graphitic C through 300 mesh	3.50%	8.90%

As one would anticipate, Figs. 1A and 1B revealed a marked difference in the size of graphitic carbon and fineness of pearlite of the two specimens. From a metallurgical standpoint, we may assume that the graphitic carbon in the matrix with the larger graphite flake and coarse pearlite will have a greater tendency to separate as fine dust on drilling than will the matrix of small graphite and fine pearlite. Therefore, if a grab sample is used for carbon determinations involving any material containing graphitic or free carbon, unreliable results may be obtained, particularly if small samples are used.

For this reason, in referring samples to other laboratories for check analysis, pieces of the original full size section should be submitted, when possible, rather than drillings or cuttings.

Carbon Determination Methods—Several available methods for total carbon tests avoid particle size segregation and loss of graphite by dusting, and provide a homongeneous sample.

1. Cast a pencil-like piece and cut off solid slugs for a sample.
2. Cast a sample in a chill mold, or cast the end of a specimen against a metal chill. Broken fragments of the white or chilled iron are used as a sample.
3. Cast metal shot, either air or water quenched.
4. After drilling a large sample from a test specimen containing finely divided pearlite and graphite, mull (do not pound) in a mortar, until sample is finely divided (100 to 200 mesh). A grab sample weighing at least 0.8000-gram is used.

When total and graphitic carbon must be determined with a high degree of accuracy from a casting or standard test bar, and the sample is to represent the cross section for either graphitic or combined carbon, the material is drilled through with a small drill. All drillings are saved, weighed and checked for carbon. However, if the problem of a given casting is one of machinability due to hardness, the affected area, not the cross sectional area, should be checked for combined carbon. In practice this condition normally is checked by hardness, visual fracture examination or microstructure examination for free iron carbide. A check for carbon, silicon, manganese, chromium, and, in some cases, sulphur and phosphorus may also be required to determine if the iron is unbalanced in composition for a given casting in relationship to the cross-sectional size of the part.

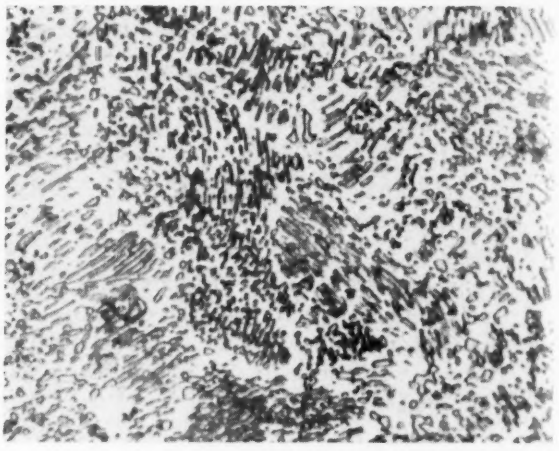


Fig. 4—Micrographs of samples made from test bars shown in Fig. 2. Left to right: Bar 1,

Sampling of Malleable Irons—Various grades of pearlitic malleable irons may exist whose structures consist of ferrite, temper carbon with various amounts of combined carbon in the form of pearlite, spheroids, martensite, and free cementite.

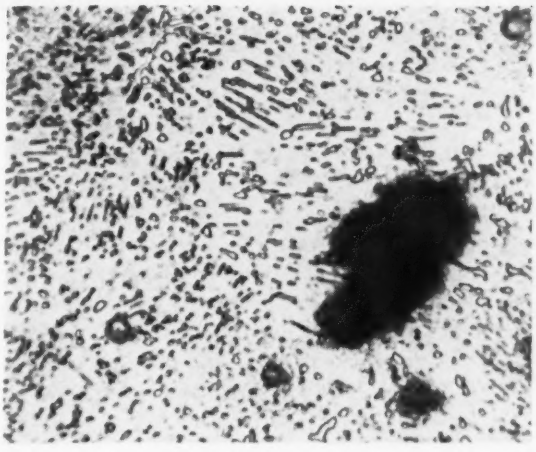
Heat treatment may result in a nonuniform distribution of temper carbon in malleable iron and of combined carbon and temper carbon in pearlitic malleable iron. Therefore, special precautions are necessary to obtain a reproducible sample which is representative of the cross-sectional area of the standard test bar, regardless of the carbon distribution. Other conditions being equal, the amount of total carbon remaining in castings after heat treatment may vary with the cross-sectional size, declining as the size decreases.

To illustrate some of the factors involved, three 1.2-in.-diam test bars were cast from the same ladle. The as-cast bars then were heat treated so as to contain variable amounts of combined carbon as spheroids, other conditions being equal.

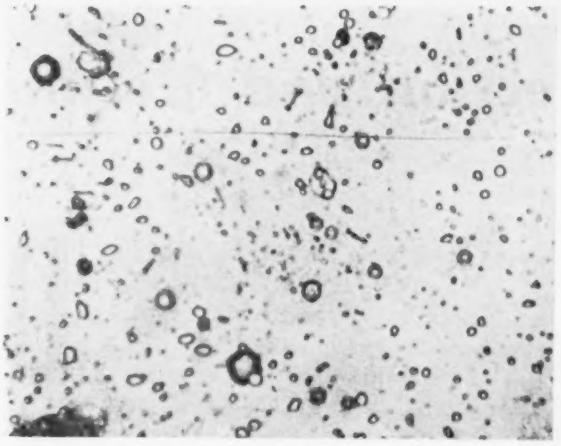
To obtain a homogeneous structure for total carbon and combined carbon distribution after heat treatment, the bars were turned down to $\frac{5}{8}$-in.-diam, the same as the standard tension bar. The bars were then shaped to 5/16-in. half round. Half-disk samples for analysis were cut so as to be equivalent in size and shape to half disk samples as cut from standard tension bars for control work.

Before sampling, the flat faces of the bars were given a final grind on 320-grit paper, followed by a light etch in hot HC1 (1-1) which revealed the bars to be free of any internal shrinkage or inverse segregation. See Fig. 2.

The following carbon results were obtained on the standard bars by direct combustion for both total and graphitic carbon, using half-disk samples approximately 3/64-in. thick. Obviously, the disk sample is always representative of the material or cross-sectional area for total chemistry, if so desired. The combined carbon in this material may



0.73 per cent combined carbon and brinell 229. Bar 2, 0.47 per cent combined carbon, brinell



187. Bar 3, 0.17 per cent combined carbon and brinell 149. All micrographs made at 1000 X

also be determined by color[2]. If dilute nitric acid is used to dissolve the sample, reference samples or standards of like composition and microstructure should be used to plot the working curve or graph.

	Bar No. 1	Bar No. 2	Bar No. 3
Total carbon	2.29%	2.29%	2.29%
Graphitic carbon	1.56	1.82	2.12
Combined carbon (diff.)	.73	.47	.17

To reveal particle size segregation on a drilled sample through the cross section, the following determinations were run on the curls and fines. Approximately a 20-gram sample was drilled from each bar.

Curls

	Bar No. 1	Bar No. 2	Bar No. 3
Total carbon	2.14%	1.99%	2.12%
Graphitic carbon	1.45	1.69	1.94
Combined carbon (diff.)	.69	.30	.18

Fines (Through 80 Mesh)

	Bar No. 1	Bar No. 2	Bar No. 3
Total carbon	2.74%	3.47%	2.84%
Graphitic carbon	2.52	3.07	3.18
Combined carbon (diff.)	.22	.40	...

From those data, it is obvious one may expect unreliable results for carbon determinations for either malleable or pearlitic malleable iron if a grab sample is a portion of a larger drilled sample. Even though the total weight of a drilled sample is used for analysis, it represents merely a selected area, and not the cross section. Therefore, the sample selected should not only represent the cross-sectional area but maintain the relative relationship which exists between the two forms of carbon present. This will result in a closer relationship between the final physical properties and chemical composition.

A slotted die or collar (Fig. 3) may be used to obtain samples. A complete disk or half-disk sample may be used. Disk samples also may be cut from the standard bars with a lathe and cut-off tool. The slotted die is slipped over the test bar and held in place by a set screw. The bar then is cut approximately 75 per cent through the cross section with a hack-saw blade, using the slots as a guide to obtain equally spaced cuts of .0040-in. After several cuts have been made, depending on the number of samples desired, the die is removed and reversed from its former position.

A slot is provided in the end of die to saw the test bar off center in a longitudinal direction, resulting in a flat, half-disk sample weighing approximately 0.6500-gram which is chemically representative of the material and a reproducible means of sampling. Therefore, the chemistry obtained is directly related to the physical properties of the test bar which represents the cross-sectional area.

It is evident that the chemical analysis of any ferrous material can be no more representative of the material than the sample. Metals may be sampled at various stages of manufacture, processing and fabrication, and the methods of sampling are sometimes varied to meet different conditions. For example, both malleable iron and pearlitic malleable iron are produced from white iron which is uniform in total carbon as-cast.

In the past, variations have occurred between different laboratories checking irons containing both graphitic and combined carbon. No doubt, improper sampling has been responsible in some cases for the variations found in the carbon results. It is hoped that this article may be of some help by contributing to better methods of sampling.

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2. Jamieson, A., "Colorimetric Determination of Combined Carbon," FOUNDRY, October, 1955, pp. 132-134.

Selection and Melting of DIE CASTING ALLOYS

Analyses of the common die casting alloys with some rules of thumb to provide the man in the shop with data as background for improvement of operating procedures. Accent is on selection, handling and melting of the more common alloys

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DESPITE the many advances in die casting in the last ten years, a noticeable lag has existed in the area of melting and treating available alloys. Representative of this inertia is the frequency with which we hear terms like "Burn up the scrap" applied to the remelting of unusable castings. Oddly enough, this situation exists despite the mass of knowledge metallurgists have accumulated relating to the behavior and treatment of aluminum, zinc and other alloys regularly die cast.

Any study of materials and alloys available should include some hard and fast rules of thumb which the man in the shop can apply to his every-

TABLE I—Aluminum Die Casting Alloys

Common Designation	ASTM	Al, %	Cu, %	Fe, Max. %	Si, %	Mn, Max. %	Mg, %	Zn, Max. %	Ni, Max. %	Sn, Max. %	Others, except Al, Max. Total %
218	G8A	remainder	0.2 max.	1.8	0.3 max.	0.3	7.5-8.5	0.1	0.1	0.1	0.2
43	S5C	remainder	0.6 max.	2.0	4.5-6.0	0.3	0.1 max.	0.5	0.5	0.1	0.2
13	S12B	remainder	0.6 max.	2.0	11.0-13.0	0.3	0.1 max.	0.5	0.5	0.1	0.2
13	S12A	remainder	0.6 max.	1.3	11.0-13.0	0.3	0.1 max.	0.5	0.5	0.1	0.2
85	SC54B	remainder	3.0-4.0	2.0	4.5-5.5	0.5	0.1 max.	1.0	0.5	0.3	0.5
85	SC54A	remainder	3.0-4.0	1.3	4.5-5.5	0.5	0.1 max.	1.0	0.5	0.3	0.5
A380	SC84A	remainder	3.0-4.0	1.3	7.5-9.5	0.5	0.1 max.	1.0	0.5	0.3	0.5
380	SC84B	remainder	3.0-4.0	2.0	7.5-9.5	0.5	0.1 max.	1.0	0.5	0.3	0.5
A360	SG100A	remainder	0.6 max.	1.3	9.0-10.0	0.3	0.4-0.6	0.5	0.5	0.1	0.2
360	SG100B	remainder	0.6 max.	2.0	9.0-10.0	0.3	0.4-0.6	0.5	0.5	0.1	0.2
384	SC114A	remainder	3.0-4.5	1.3	10.5-12.0	0.5	0.1 max.	1.0	0.5	0.3	0.5

day problems. I shall discuss the rudiments of these simple rules and attempt to relate them to alloys used today by American die casters.

Over the years, an ever-growing list of metals and alloys has been die cast commercially. Some new compositions have appeared, and others have become obsolete. The new compositions owe their existence to continuing research and development work by research agencies, producers and smelters and societies like the American Society for Testing Materials, the Society of Automotive Engineers, the American Foundrymen's Society and others.

These metals are die cast regularly: Aluminum-base, zinc-base, magnesium-base, copper-base (brass) and lead and tin-base alloys. Our major concern is with the first three, which account for the bulk of all die castings.

Aluminum-base Alloys—Aluminum alloys are extremely susceptible to the absorption of hydrogen, the adsorption of other gases and the formation of oxides, nitrides and carbides. These weaknesses, coupled with the fact that these oxides, etc., are of almost the same specific gravity as aluminum, are basically the cause of most porosity and so-called dirt (inclusions) in aluminum alloy castings. The die caster therefore should use every tool available to prevent the occurrence of these materials in his products. A few dos and don'ts should serve to help everyone involved, including the consumer.

DO these things:

1. Buy aluminum ingot from reputable sources and insist on cleanliness and freedom from gas.
2. Melt only ingot in your casting furnace.
3. Flux remelted metal completely before using, so as to insure freedom from dross, oxides and gas.
4. Use a flux suitable for the alloy you are casting.
5. Ladle so as to break the surface of the melt as little as possible.
6. Keep ladle as close to metal sleeve as possible.
7. Skim the casting pot regularly and after each addition of new metal.
8. Remove sludge from iron pots regularly.
9. When pouring avoid broken streams and pour from minimum heights.
10. Maintain reducing flames in direct-fired furnaces.
11. Degas melts which contain excessive gas. Use the gas removal method most suitable to your setup (fluxes, dry gases, chlorine, etc.).
12. Use the advice of a competent metallurgist.

DO NOT do these things:

1. Allow ingot to get wet or heavily oxidized. If it does, make certain that it is thoroughly dried before attempting to melt it. Heavily oxidized ingot will require additional treatment.
2. Melt oily or wet scrap in your casting furnaces.
3. Hold metal for long periods at high temperatures.
4. Slosh metal with ladles or tools.
5. Burn paper, trash or oil on your metal.
6. Stir the sludge in an iron pot into the melt.

ASTM now considers 11 aluminum die casting alloys to be in commercial use. These are listed in Table I and fall into six basic groups. They include the 8 per cent Mg; 5 per cent Si: 12 per cent Si; 3½ per cent Cu, 4.5-9.5 per cent Si; 9½ per cent Si, ½ per cent Mg; and 4 per cent Cu, 11 per cent Si alloys.

Variations which bring the total to 11 alloys include two ranges in the iron content of some alloys, basically to serve low-iron cold-chamber and high-iron hot-chamber die casting machines. Table I lists the generally accepted chemical composition limits for these aluminum alloys.

At present, values for the mechanical properties of these alloys are undergoing complete modernization through the efforts of ASTM, and the values given in Table II are to be considered only as guides until the new values are available.

These properties are of prime importance to the designer of castings, but he also must consider corrosion resistance, ease of anodizing, pressure tightness, suitability for welding and brazing, strength at elevated temperatures, ease of machining and polishing, etc., in addition to the castability of each alloy. The die caster wants to know about die filling capacity, resistance to hot cracking, cost, metal loss, ease of handling, resistance to chemical and other contamination and many other factors.

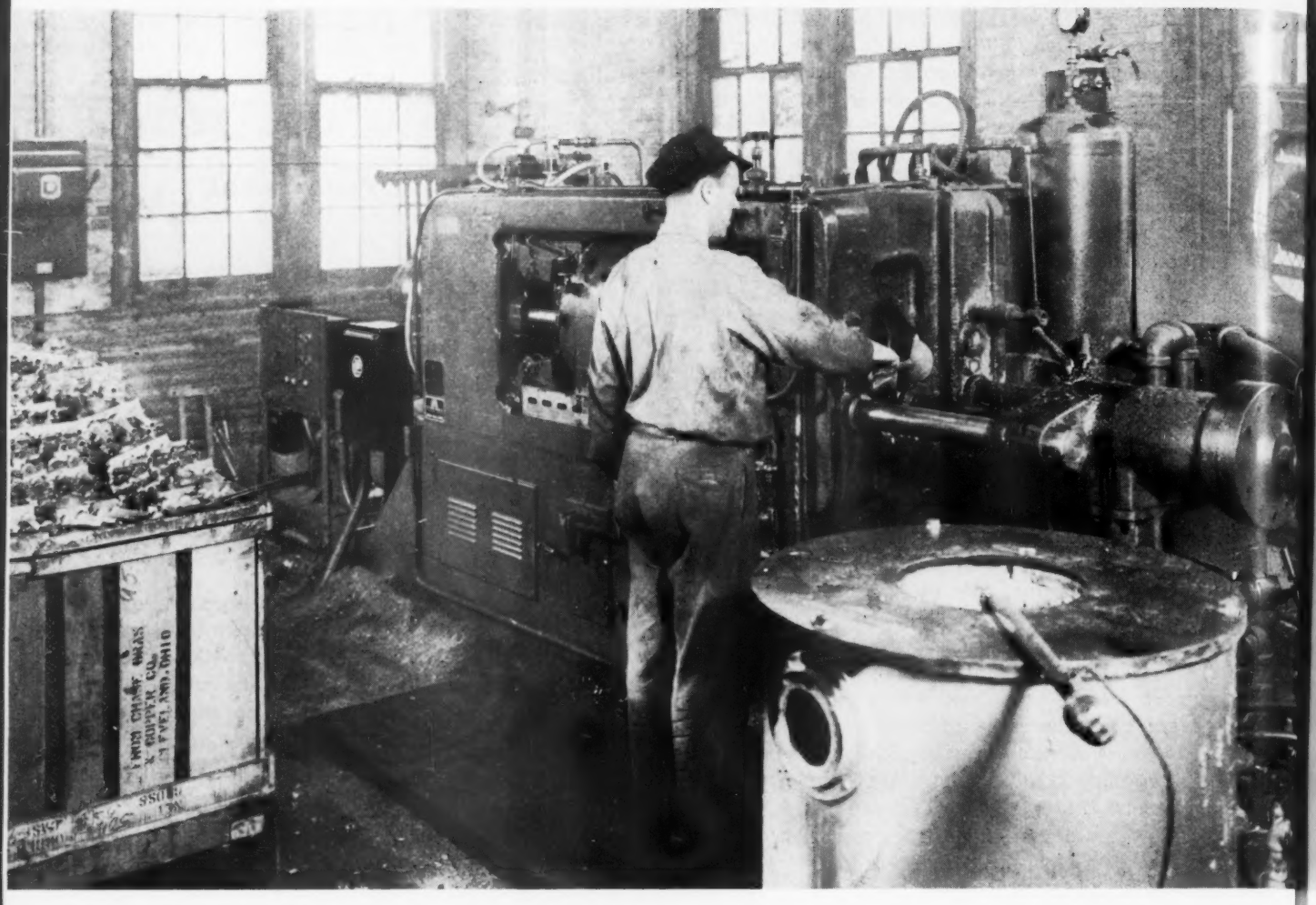
Some of these factors have been rated by agreement in the industry, and I refer you to the AFS for publication of its latest ratings. ASTM ratings on the same alloys also will be published by late 1955 and early 1956. I should like, however, to rate them here for corrosion resistance, by group, in the order of descending resistance: The 8 per cent Mg (218); ½ per cent Mg, 9½ per cent Si (360); 5 per cent and 12 per cent Si (43 and 13); 3½ per cent Cu, 8½ per cent Si and 3½ per cent Cu, 11 per cent Si (380 and 679); and 3½ per cent Cu, 5 per cent Si (85) alloys.

A small tonnage of pure aluminum is die cast, but it presents special problems to the die caster. Its corrosion resistance is above that of all others.

Magnesium-base Alloys—Most die castings of magnesium are made by the cold-chamber process, although the newer hot chamber process is seeing increasing use. Melting is done in cast or welded steel pots, and the surface of the casting pot is

TABLE II—Mechanical Properties of Aluminum Alloys

Alloy		Tension Test, Round Specimens		Charpy Impact on Square Specimens, Ft-Lb
Common Designation	ASTM	Tensile Strength, Psi	% Elongation in 2"	
218	G8A	41,000	7.5	8.3
43	S5C	30,000	5.0	4.5
13	S12B	37,000	1.8	2.0
13	S12A	35,000	3.5	...
85	SC54B	38,000	2.5	2.5
85	SC54A	35,000	3.0	3.0
A380	SC84A	49,000	4.0	3.5
380	SC84B	49,000	3.0	3.2
A360	SG100A	43,000	5.0	4.2
360	SG100B	43,000	3.0	2.7



When pouring, better castings result if ladle is kept close to the injector

protected by either a sulphur dome or a sulphur dioxide atmosphere. Great care should be exercised in the melting of magnesium to avoid unnecessary burning. Use of the aforementioned domes, together with a suitable flux, usually is sufficient. In addition, proper care must be exercised in handling.

DO NOT do these things:

1. Melt heavily oxidized metal.
2. Melt wet or cold metal.
3. Splash or otherwise expose molten magnesium to the air.

DO these things:

1. Preheat tools and ladles carefully.
2. Maintain a constant protective cover, either flux or gas.
3. Sludge pots carefully to avoid inclusions.
4. Seek expert advice if handling is a problem.

For most purposes, only two magnesium alloys are in general use. Both contain approximately 9 per cent aluminum and 1 per cent zinc, with minor other elements, and differ only in copper content. Table III gives their exact composition limits and Table IV their approximate mechanical properties.

Zinc-base Alloys—Several melting precautions are noteworthy with zinc alloys.

DO these things:

1. Allow time in alloying for light sludge to come to the surface, where it can be removed carefully.
2. Keep machine pots skimmed regularly.

TABLE III—Magnesium Die Casting Alloys

Common Designation	ASTM	Al, %	Mn, % Min.	Zn, %	Si, % Max.	Cu, % Max.	Ni, % Max.	Other, % Max.	Mg, %
R	AZ91A	8.3–9.7	0.13	0.4–1.0	0.5	0.10	0.01	0.30	Rem.
RC	AZ91B	8.3–9.7	0.13	0.4–1.0	1.5	0.30	0.01	0.30	Rem.

TABLE IV—Mechanical Properties of Magnesium Alloys

Common Designation	ASTM	Tensile Strength	Elongation, % in 2"	Charpy Impact, Ft-lb
R	AZ19A	29,000–34,000 psi	2–5	1–3
RC	AZ19B	29,000–34,000 psi	2–5	1–3

TABLE V—Zinc-base Die Casting Alloys

	ASTM No. 3 (XXIII)	ASTM No. 5 (XXV)
Aluminum, %	3.5 to 4.3	3.5 to 4.3
Copper, %	0.15 max.	0.75 to 1.25
Magnesium, %	0.03 to 0.08	0.03 to 0.08
Iron, % max.	0.100	0.100
Lead, % max.	0.007	0.007
Cadmium, % max.	0.005	0.005
Tin, % max.	0.005	0.005
Zinc	bal.	bal.

TABLE VI—Mechanical Properties of Zinc Alloys

Alloy	Tension Tests, Round Specimens		Charpy Impact, Sq Specimens, 500 kg, 10-mm Ft-lb	Bhn
	Tensile Strength, psi	Elongation, % in 2"		
XXIII	35,000	10	35	65
XXV	40,000	5	35	85

TABLE VII—Copper-base Die Casting Alloys

	Alloy		
	Z30A	ZS331A	ZS144A
Copper, %	57.0 min.	63.0–67.0	80–83
Silicon, %	0.25 max.	0.75–1.25	3.75–4.25
Lead, max. %	1.50	0.25	0.15
Tin, max. %	1.50	0.25	0.25
Manganese, max. %	0.25	0.15	0.15
Aluminum, max. %	0.25	0.15	0.15
Iron, max. %	0.25	0.15	0.15
Magnesium, max. %	...	...	0.01
Others, max. %	*0.50	*0.50	*0.25
Zinc, %	30.0 min.	Remainder	Remainder

*Arsenic, antimony and sulphur shall not exceed 0.05 per cent each, and phosphorus shall not exceed 0.01 per cent.

DO NOT do these things:

1. Exceed 925° F for extended periods of time.

2. Stir surface sludge into the melt or allow mechanical stirring devices to do so.

3. Allow the melt to drop below the top opening in the gooseneck of hot chamber machines.

Zinc-base alloys have a long and exciting history as the result of research dating from 1922 in efforts to improve the properties of these alloys. Today, three alloys are in use, although two account for better than 98 per cent of zinc alloy production. These alloys are essentially 4 per cent aluminum with from 0 to 1.25 per cent copper, the remainder in each alloy being high-purity zinc. The third alloy (XXI) contains approximately 3 per cent copper. In the light of present day research, the 3 per cent copper alloy rapidly is approaching extinction, and the preponderance of casting is done in the low-copper alloy, XXIII, commonly known as Zamak No. 3. Table V shows the complete composition of the alloys in use.

It should be noted that only special high grade zinc of highest purity is allowable for the manufacture of these alloys. It usually is referred to as 4-9 (99.99 per cent) zinc.

The zinc alloys undergo certain important changes upon aging, and consideration must be given to the effects of these changes on the castings made with them. Most notable is the drop in impact strength of the XXV alloy, and for this reason its use soon may be considerably limited. Other properties worthy of note here are:

1. Loss of impact strength at 0° F.

2. Loss of impact strength (especially in alloy XXV) at 200° F and higher in continuous service. It is recommended that neither alloy be used in such continuous service.

3. Enough cannot be said regarding the loss of properties in the alloys when contamination exceeding composition limits exists in the heavy metal group—lead, tin, cadmium, etc. These materials allow intergranular corrosion to take place at a rate which is disastrous, especially in hot and humid atmospheres.

Mechanical properties for design purpose may be interpreted from Table VI with caution.

Copper-base Alloys — Three copper-base alloys are in limited production today and hold promise of tremendous possibilities when die materials are available which will give adequate die life. They are basically copper-zinc mixtures with varying percentages of silicon.

Table VII shows the commonly used alloys.

Lead and Tin-base Alloys—The lead and tin alloys frequently are referred to as babbitt metals and are used primarily for bearings. Table VIII lists current specifications covering these alloys.

Little need be said regarding the melting of these alloys except that cleanliness is important and that maximum temperatures, as indicated by the compositions of the various alloys, should not be exceeded. Because of the high specific gravity of these metals, stirring is of great importance.

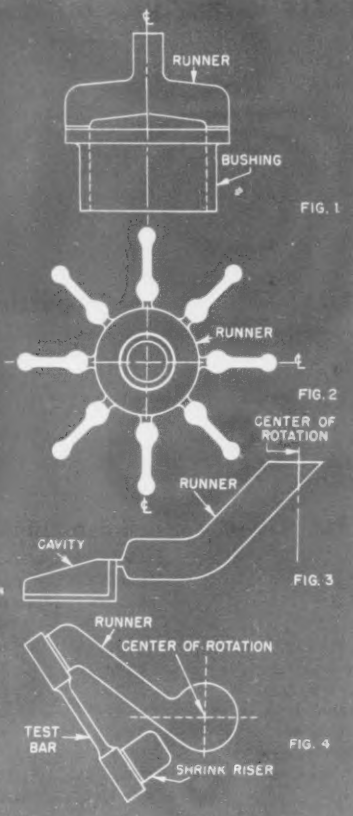
It is the feeling of the author that attention to some of the principles laid down here will go far toward advancing the acceptance of die castings by all industry.

TABLE VIII—Lead and Tin-base Die Casting Alloys

Alloy	Sn, %			Antimony, %			Lead, %			Copper, %			Others, Max. %			
ASTM	Min.	Desired	Max.	Min.	Desired	Max.	Min.	Desired	Max.	Min.	Desired	Max.	Fe	As	Zn	Al
CY44A	90	91	92	4	4.5	5	..	..	0.35	4	4.5	5	.08	.08	.01	.01
YC135A	80	82	84	12	13	14	..	..	0.35	4	5	6	.08	.08	.01	.01
PY1815A	64	65	66	14	15	16	17	18	19	1.5	2	2.5	.08	.15	.01	.01
YT155A	4	5	6	14	15	16	79	80	81	..	..	0.50	..	.15	.01	.01
Y10A	..	..	..	9.25	10	10.75	89	90	91	..	..	0.50	..	.15	.01	.01

Centrifugal Casting of

Aluminum in Permanent Molds



By RUSSELL H. GARNER

CENTRIFUGAL force has been used successfully in many ways to cast molten metal. This article, however, will deal only with centrifugal casting of aluminum alloys in permanent molds.

The equipment used is specially designed and constructed and consists primarily of a vertical spindle driven by a variable-speed motor. Molds or mold tables are bolted to a flange which in turn is screwed onto the spindle of the mold machine, in much the same manner that a face plate is screwed onto a lathe. The flange is locked in place so that the machine may be stopped or reversed quickly.

Fig. 5 shows a diagram of a No. 1 machine. This unit has a 1½-in. spindle, a 1-hp motor and chain drive. The drawing is cut away to show spindle, motor and drive. Wiring and guards are omitted. Space is provided under the mold tables to allow for core pullers and closers. Molds and mold tables must be carefully balanced so that they will run without vibration at 500 rpm. A static balancing spindle accomplishes this balance. Cooling fins are used around the spindle, just below the mounting flange, to prevent the heat from the molds from overheating the top roller bearing. The frame is made of welded angle steel, and the unit is enclosed in sheet steel.

Electric motor brushes are used on the insulated rings to connect single-phase, 220-v current to the spindle, which is hollow. Wires are led out at the side of the spindle, above the spindle housing. From terminals at this point, asbestos-insulated wires are connected to strip or ring heaters attached on either top or bottom halves of molds.

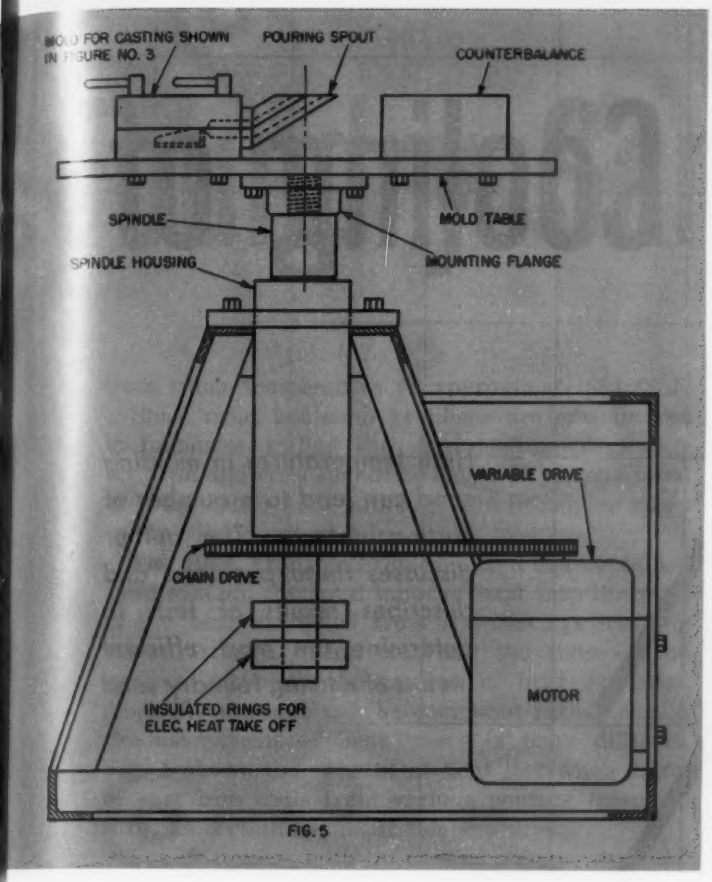
Most castings are poured with the mold static. The machine then is started quickly, before the metal has time to cool. Molds and machines therefore are built to be as light as possible so that the spindle revolves at full speed in about one revolution.

Three Types of Molds—Molds can be divided into three general types. First is the ring or bushing type (Fig. 1). It has an extended split pouring riser in the center and is poured statically, then rotated to about 500 rpm. Thin-walled, symmetrical rings are poured during spinning.

Second is the multiple-cavity type (Fig. 2), consisting of a series of cavities grouped around a centered pouring runner. This type is poured static, and spinning is started rapidly. For very thin-walled castings, however, the machine is revolved at full speed during pouring. The gates should be small and the cavities should be well vented.

The third is for a single, off-center cavity and is poured from the center through a curved pouring spout (Fig. 3). These are poured static, and rotation is started as quickly as possible. This type of mold can be used for single-cavity, short-run jobs or for very complicated castings.

When the pouring spout is centered on the



Figs. 1-3—Three general types of molds are, 1 through 3, ring or bushing type; multiple-cavity type; and a single, off-center cavity type

Fig. 4—Test bar mold is poured statically into center and then is rotated at about 500 rpm

Fig. 5—Diagram illustrates No. 1 type machine

center of rotation, thin-walled castings may be poured during spinning. In certain complicated, thin-walled castings, the mold is heated in spots with strip or ring electric heaters.

The test bar mold is poured into the center statically and then rotated at about 500 rpm (Fig. 4). Metal runs from the center to the outer end of the test bar and flows back to a shrink riser at the other end of the bar. When the centrifugal force is on, the risers at both ends of the bar shrink into those ends, making a very dense center section. It is possible with this mold, using alloy 356-T6, to get 48,000 psi ultimate strength and 34,000 psi yield strength with 8 per cent elongation. Metal temperature is 1340° F. Federal requirements for this alloy are 33,000 psi ultimate with 3 per cent elongation. Suppliers' typical maximum values (not guaranteed) are 40,000 psi ultimate with 5 per cent elongation.

Alloys 356, 355, 195, 43 and 220 have been cast in these machines, and I see no reason why any other of the permanent mold alloys cannot be cast. To my knowledge, at this time, ingot suppliers have not made an alloy especially for centrifugal molding.

Pouring temperatures range from 1280 to 1400°F. Temperature should be kept as low as possible. It is necessary, however, to pour thin-walled castings at a maximum of 1400° F. Since different alloys vary in temperature, one should follow the recommendations of ingot suppliers.

Mold Design—In making molds, we use a shrinkage of 0.007 to 1.000 in., with smaller gates than with plain permanent molds—also more vents and less mold wash. A typical mold wash consists of 1 part whiting dust, 1 part red talc, and 2 parts sodium silicate, stirred into 400 parts of boiling water. It is sprayed into mold cavities, and risers are coated much more heavily than cavities. Mold temperature should be from 400 to 500° F.

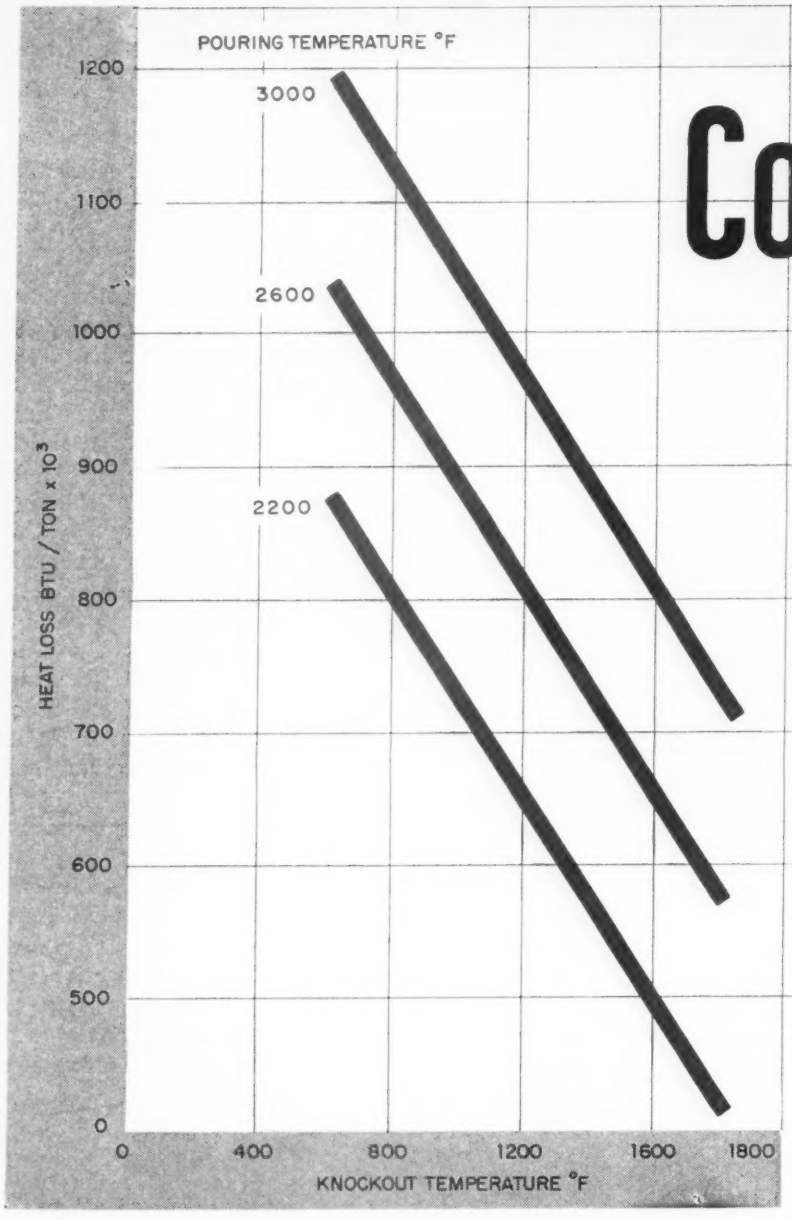
Size and weight of castings are limited by the size of the machines available. The No. 1 machine, with 1½-in. spindle, will make castings up to 10 lb, has a 24-in.-diam swing and is powered by a 1-hp motor. The No. 2 machine, with a 2-in. spindle and a 3-hp motor, will make castings up to 25 lb and has a 40-in. diam swing. One plant has a machine that will make 100-lb castings. It is powered by a 25-hp, direct-current motor and has a 6-ft swing.

The percentage yield in relation to the amount of runners and risers (remelt) runs high in ring and bushing castings—to as much as 100 per cent. A skillet mold, for example, runs about 95 per cent. Heavy-walled castings have a yield of 70 to 80 per cent, and thin-walled or small castings yield 40 to 65 per cent. The aircraft or precision type of casting runs lower because runners and risers must be more massive to take all shrinks, surface flaws and air pockets out of castings so that they will pass x-ray and Zyglo tests.

Mold vents follow somewhat the pattern of die casting dies. Crack vents are used between mold halves, mostly nearest the pouring spout. These should not be more than 0.005-in. thick and can be as wide as the cavity. We insert blocks in making molds, for easier machining of cavities. Vents may be milled on the sides of the blocks and led to the outside of the mold through grooves or round holes. Air may be trapped in inside corners —that is, a corner nearest the pouring spout— and to vent out this air, a round plug is inserted in the corner, leaving a crack around the plug of not more than 0.006-in. A groove is cut around the plug about ⅛-in. from the cavity, and the air is led to the outside of the mold through grooves or holes.

Inserts such as bushings, pins, plugs or laminations can be molded into castings. These can be steel, brass, bronze, stainless steel or even aluminum. They can be plated as long as the plating melts at a higher temperature than aluminum.

Castings can be made by this method that are almost as accurate as die castings. They will pass aircraft x-ray, Zyglo and chemical tests. High-grade commercial castings also can be made at very reasonable cost.



Cooling of

High temperatures in molding sand can lead to a number of casting defects. The author discusses these problems and describes results of tests to determine the most efficient means of cooling foundry sand

By DR. G. MARTIN
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Fig. 1—Chart illustrates heat loss on cooling of castings

EXCESSIVELY high temperature of molding sand can lead to trouble. Major problems resulting from hot sand are: Bad pattern strip; rapid drying of mold edges before closing, causing erosion and dirty castings; blow holes resulting from excessive condensation; and changes in sand properties. Bentonite or natural bonded sands may dry out rapidly, with the increase in green strength leading to hot tears. Some additions, such as pitch, may show an undesirable decrease in green strength when hot.

Sand temperature in a mold after pouring varies widely between that of a small zone near the casting and the outer mold surface temperature. The longer the casting remains in the mold, the narrower this range becomes, but the more heat is absorbed by the mold. After shakeout the sand is composed of a small portion at a very high temperature, a large portion heated to some degree and another large portion barely heated at all. The ratio of these various portions depends on the casting and shakeout temperatures and the amount of sand present. This nonuniformity presents one of the main difficulties in measuring over-all temperatures of sand and designing suitable coolers.

Because of these variations it seems desirable to talk about three sand temperature ranges rather than about actual sand temperatures. Average temperatures are important, but are of theoretical value only. The three temperature ranges suggested are:

1. Hot dry sand, such as obtained from a steel casting shakeout, with temperature fluctuating from just above 212°F to 1000°F and more.
2. Hot moist sand, like that obtained from an iron casting shakeout, with its major bulk just below boiling point and only minor portions exceeding this temperature.
3. Cooled sand, with a temperature range of

Foundry Sands

from room temperature to approximately 100° F.

Since most hot sand problems are encountered in foundries dealing with high-melting-point metals, iron and steel foundries only will be considered in some detail here, although the principles apply to any type of foundry.

The Heat Transfer Problem—In a self-contained sand system, the total input of heat into the sand is the heat extracted from the castings less the losses through risers, etc., and the sides of the molds. Although the amount of heat extracted from the castings can be computed rather easily, the assessment of heat losses is more difficult. Fig. 1 shows the amount of heat lost when 1 ton of cast iron cools from various pouring temperatures to certain shakeout temperatures.

For instance, with a casting temperature of 2600°F and a shakeout temperature of 1000°F, a total of 900,000 Btu is absorbed by the molds or passed to atmosphere per ton of metal. Taking an average figure of 6 tons of sand used for every ton of metal cast, this amount of heat, were it all absorbed by the mold, would mean a sand temperature rise of 335°F. In practice the average temperature rise is much smaller, and it therefore can be assumed that 30 to 50 per cent of the heat given off by the castings is passed to atmosphere during cooling or carried off with the castings in the small amount of surface sand or cores adhering to them.

Nevertheless, the amount of heat given off per ton of casting, even if halved, is still formidable. Some idea of the size of the problem involved may be gained from the fact that a heat throughput of 2500 Btu per hour is equivalent to 1 hp.

Heat itself can be conducted by radiation, convection and conduction. Although radiation is important in the heat transfer from the hot casting to the mold at the interface, it does not appear to be of appreciable importance in the cooling of sand when dealing with much lower temperatures.

Heat flow by convection plays a major role in sand cooling problems. The rate of heat flow between sand and air can be expressed by the relation, Rate of heat flow = h x area x temperature difference, where h is the coefficient of heat transfer, determination of which was one of the main tasks of this investigation.

As simple as this relation looks, there are some severe limitations in its practical application, and the exact determination of the heat transfer coefficient becomes rather complicated. In some cases fairly exact data are available, but in others an equivalent over-all coefficient has to be derived. This value is applicable only for the experimental limits used, but within those limits it is suitable for design calculations.

Heat transfer by conduction is important for the determination of the cooling rate of a solid body, such as a sand grain or the agglomeration of sand in a hopper. The controlling factors are the thermal conductivity of the sand, its specific heat and its density, as well as its surface and initial temperature. The equations connecting these factors are well known, but rather complex; they are not given here since they can be obtained from any standard textbook. Solutions to these equations have been worked out for the cases of interest here—that is, for nonsteady heat flow—and for the present work the solutions given by Heisler[1] have been used.

Theoretical Considerations—The problem of cooling foundry sand has two aspects: 1. The heat flow from the center of a sand grain or aggregate to its surface. 2. The removal of heat from the surface of the sand grain or aggregate in order to maintain the heat flow within it.

All cooling methods therefore can be divided according to size of the material cooled—individual sand grains or small agglomerates of a few grains or bulk sand—or according to the method used to maintain the surface temperatures. They therefore can be summarized as follows:

1. Individual grains or small agglomerates.
   a. Cooling by air (aeration)
   b. Cooling by evaporation of surface moisture
2. Bulk sand.
   a. Cooling by contact with cold surfaces
   b. Water cooling (spraying or immersion)
   c. Cooling by air

Cooling of Individual Grains—If sand grains are considered to be perfect spheres of silica, the cooling rate can be calculated once the coefficient of heat transfer is known. This coefficient unfortunately is not available for the case of spheres, but determinations have been made for both forced-draft cooling and natural convection cooling of thin cylinders.

From these data the heat transfer coefficient can be worked out. For a cylinder 1 mm in diam, this coefficient for natural convection is 0.00052 cgs units or 3.83 Btu/hr.ft^2.°F. For a forced draft of

750 cu ft/min/sq ft of air, this coefficient is 0.0032 cgs units or 23.6 Btu/hr.ft².°F.

From these two values the cooling time for grains of any diameter can be determined readily from the tables given by Heisler.[1] The results are plotted in Fig. 2 (together with some experimentally determined data discussed later) for grains cooled from an initial temperature of 212°F to a final temperature of 86°F in air of 60°F. A 30-mesh grain, for instance, requires 2 seconds to cool in a forced draft and 12 seconds in still air, where heat transfer has to rely on natural convection currents and radiation. In all but washed sands, individual grains rarely exist even if the sand is broken up by an aerator. The grain size is probably on the order of 1 to 3 mm, with correspondingly longer cooling times.

All the above calculations assume that the surface of the sand is maintained at a constant low temperature during cooling; in fact, the results show the low thermal conductivity of the grain limits the speed at which even small grains are cooled.

The constant surface temperature can be achieved either by a supply of air sufficient to extract the heat or by evaporation of the moisture present in the sand. The heat that can be absorbed by dry air is 0.0184 Btu/cu ft/°F. To cool sand through 212°F at a rate of 1 ton per hour, a rate of air flow of 400 cfm is required, assuming fully efficient heat exchange.

The heat that can be absorbed by air through the evaporation of water is governed by its initial humidity and the temperature before and after absorption. For each given temperature of air and humidity value there is a lower temperature at which this air would be saturated with water. Fig. 3 shows these saturation temperatures for a range of air temperatures for a humidity of 60 per cent. Also shown on the graph is the heat that is absorbed by a cubic foot of air of any temperature and initial humidity of 60 per cent on being saturated with water and heated to a higher temperature. For instance, air at 60.8°F and 60 per cent humidity is saturated at 52.7°F.

Heat content of air at 60.8°F is 2.12 Btu per cu ft, and at 52.7°F it is 1.75 Btu. A cubic foot of air at 60.8°F and 60 per cent humidity will therefore absorb 2.12 − 1.75 = 0.37 Btu on being saturated with water. To cool a ton of sand through 212°F in an hour, maintaining an air temperature of 60.8°F, would require 4300 cfm of air. If, however, the air temperature is allowed to rise, considerably smaller air quantities are required. For instance, if the air temperature is allowed to rise to 104°F, only 300 cfm is required theoretically. In practice, 100 per cent efficiency of heat transfer is, of course, not achieved.

Cooling of Sand in Bulk—Analogous to the method of working out the cooling rate for sand grains, cooling rates can also be determined for bulk sand stored in hoppers or heaps. Although one would expect the heat transfer coefficient to be of the same order as for small aggregates, no data are available and information must be determined experimentally. Cooling by quenching or by contact with cold surfaces also cannot be predicted and requires experiment.

Experimental Investigations—Cooling methods have been divided according to the principal cooling mechanism employed. For experimental purposes a special cooling tower was built with forced air circulation and a rated throughput of 2 tons per hour. Bulk cooling rate was investigated in a drum filled with hot sand, temperature gradients being determined by a series of thermocouples inserted in the sand. A summary of results obtained on these investigations is given in Table I, together with results obtained on a variety of standard foundry equipment.

In addition, tests were carried out on sand before and after passing through the cooling tower. These tests showed that in the case of steel sand there is very little change in the grain size distribution, the fines content and the percentage loss on ignition. In the case of iron foundry sand there is a considerable reduction in the amount of fines and loss on ignition after passage through the cooling tower. Moisture decreases from 2.5-3.0 per cent to 0.5 per cent in the case of steel sand and from about 6.5 per cent to 1.5 per cent in the case of iron foundry sand.

TABLE I—Summary of Experimental Results

Type of Cooling and Equipment	Sand Type	Throughput, Tons/hr	Sand Temperature Hot °F	Sand Temperature Cold °F	Remarks
1. Cooling by aeration:					
Cooling tower	steel	2	140	65	
		2	150/200	110	air flow
		4	150/200	122/140	reduced
		4	300/+	140/160	
	iron	2	176/212	68/104	
		4	176/212	140/158	
		1½	104/194	68/95	
Pneumatic hoist	silica	3	260	100	
Rotating sand screen[2]	iron		115	105	
Elevator and cascade	iron		105	90	
2. Cooling by water spray:					
Conveyor belt	steel	10	220/270	130/150	
3. Contact with cold surfaces:					temp loss/100 ft
Conveyor belt[3]	iron				−4 to 4° F
Rubber conveyor belt	iron	5			4° F
Scraper conveyor	iron	5			8° F
Water-cooled steel belt[3]	iron	18	158	104+	72° F
4. Bulk Cooling:					
Drum filled with 600 lb.	steel		270	70	time 46 hrs.
Batch type mill	steel	5.5	201	131	
		8	171	131	
	iron	6.7	126	100	

Aeration Cooling—As mentioned previously, the two important aspects here are the rate of heat flow through the grain and the removal of heat from the surface of the grains, which should be maintained at a constant low temperature to facilitate the heat flow. Some recalescence of the cooled sand occurred, but it can safely be assumed that the time taken by the sand to drop through the cooler was sufficient to cool a small sand grain of say 60 mesh (.25-mm diam) down to room temperature.

From the thermal properties of silica, the heat transfer coefficient can be obtained from the equa-

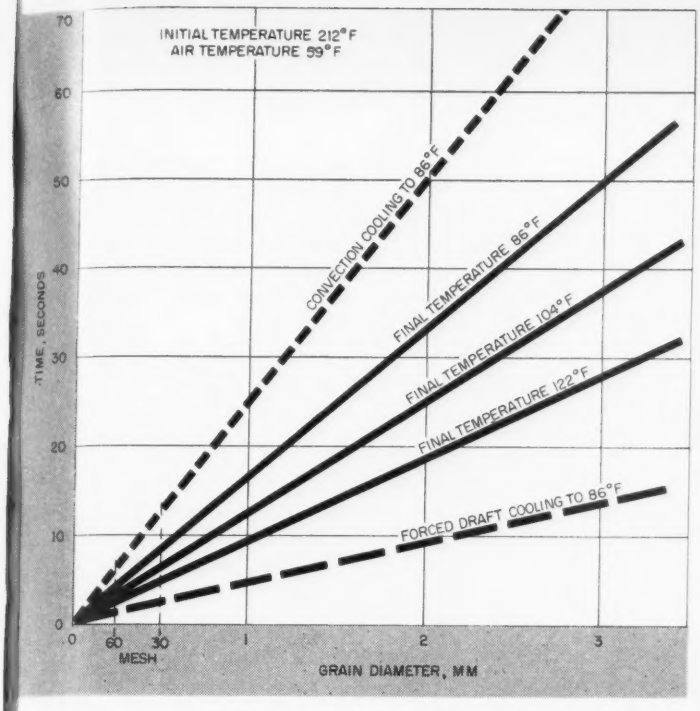


Fig. 2—Chart plots results of tests to determine cooling time for grains cooled from 212°F to a final temperature of 86°F in air at 60°F

tions and graphs given by Heisler. For an initial temperature of 212°F and a final temperature of 86°F the heat transfer coefficient works out at 0.0008 cgs units or 5.89 Btu/hr.ft².°F. This value agrees reasonably well with those predicted theoretically and allows the determination of the cooling time for any cooling range and grain size. This has been done and the results plotted in Fig. 2. These graphs show for instance that while the 60-mesh grain would be cooled after 5 seconds, a 30-mesh grain would still have a center temperature of 122°F after that time interval, and would therefore heat up slightly if leaving the cooler after only 5 seconds.

An estimate of the efficiency of aeration plant can be made from the data obtained on a pneumatic sand conveyor. The heat loss at a throughput of 3 tons of sand per hour is approximately 4400 Btu per minute through a temperature range of 157°F. The volume of air used, however, heated through the same temperature range, should absorb 10,400 Btu per minute; the efficiency was about 43 per cent. This figure ignores the heat loss of the ducting and cyclone. The efficiency of cooling by aeration with dry air through that temperature range is therefore more likely to be of the order of 25 per cent.

In the cooling tower experiments, cooling both by evaporation and by direct contact with air took place. The increase in temperature of the air unfortunately could not be measured, but from the lack of condensation around the top of the tower it could be concluded that the temperature increase was not very considerable, probably about 45°F. The cooling tower has, in fact, worked satisfactorily at a rate of throughput of 2 tons per hour, but increased rates resulted in a considerable reduction of cooler efficiency. Initial moisture content of the sand did not seem to affect the rate of cooling, within the ranges tested, and there was always some small residual moisture left in the sand.

The high rate of air flow required resulted in the extraction of considerable fines. This was particularly true of iron foundry sand, where much of the seacoal was present in the sand as fines and was removed in the cooling tower. In the case of steel sand there did not appear to be a significant loss of fines and, since some of the fines are burnt clay, their removal may even be beneficial.

Cooling of Bulk Sand—As can be expected from the size of heat transfer coefficient obtained, bulked sand cools very slowly in air. From the experiment with a drum of sand the heat transfer coefficient can be determined in a manner similar to the calculation for sand grains. It was found to be 0.00036 cgs units or 2.65 Btu/hr.ft².°F. A plot of the cooling time of tall cylindrical hoppers for various hopper diameters and the above heat transfer coefficient is given in Fig. 4 for final center temperatures of 122°F and 86°F.

In these calculations the heat loss through the top and bottom of the cylinders has been neglected, otherwise the calculations would be much more complex. The curves apply for steel hoppers only, where the thermal conductivity of the shell can be neglected in comparison with that of sand and air. In the case of brick hoppers an approximate result can be obtained by adding the total thickness of the hopper wall to the diameter of the hopper, as the thermal conductivity of brick is comparable to that of sand. For instance, hot sand in a 6-ft-diam steel hopper would cool from 212°F to 86°F in about 11 days, while in a hopper of like capacity built of 9-in. brickwalls it would take 17 days.

Cooling sand by spraying appears to be the more effective the higher the temperature of the sand. While sand with a temperature of over 212°F can be cooled on a belt to about 120-140°F very rapidly, and hot moist sand on milling (where intimate mixing with water but no aeration takes place) can be cooled from 200°F to 130°F, warm sand of about 120°F cools through only 15 to 25°F. None of the equipment tested was fitted with an efficient exhaust to remove the steam formed. Such an exhaust would no doubt increase the cooling efficiency; however the increase would be small because the sand is not sufficiently finely divided for effective aeration.

All information agrees that no cooling takes place on conveyor belts unless the sand is spread very thinly, and an efficient means of heat removal is provided such as in water-cooled steel belts. This also applies to chutes or bucket hoists. In the case of a water-cooled steel belt, the data provided by the Sandvik Steelband Conveyor Co. allow the calculation of an over-all heat transfer coefficient of 0.37 cgs units or 272 Btu/hr.ft².°F.

Choice of the most suitable cooling method de-

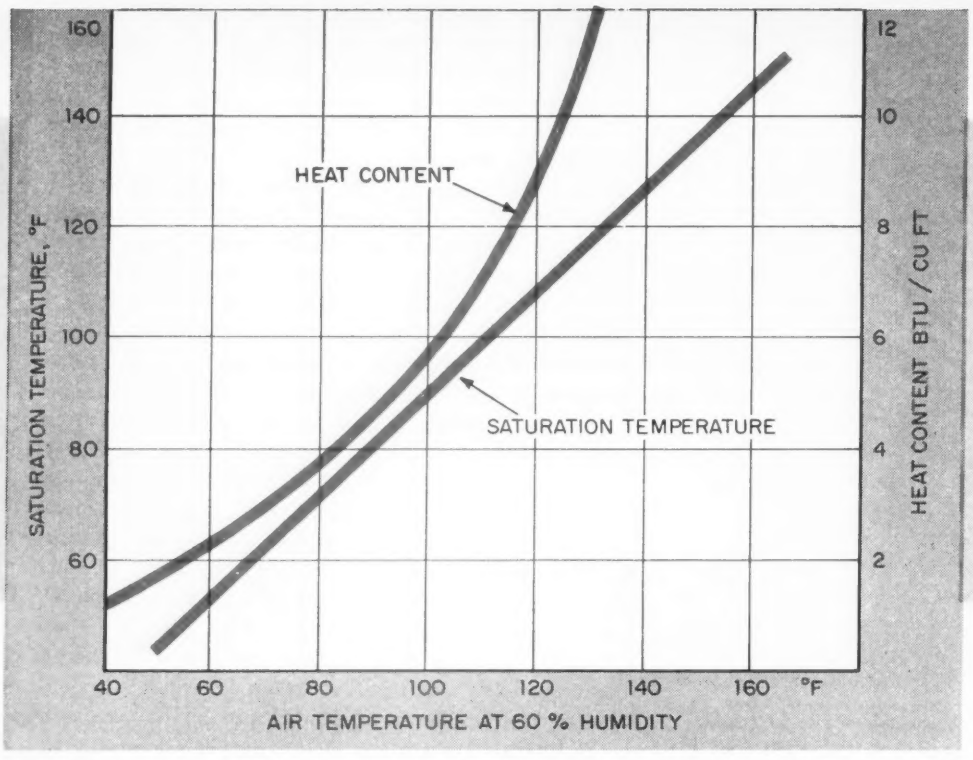


Fig. 3 — Saturation temperature and heat content at 60 per cent humidity

Fig. 4—Showing the time required to cool sand in tall cylindrical hoppers

pends on the type of sand to be cooled and its initial temperature, and the throughput and the layout of the sand unit in which the cooler is to be incorporated.

Types of Cooling Equipment—From the investigations it can be concluded that general sand handling and preparation equipment is unsuitable for effective cooling and special facilities must be provided where cold sand is essential. These can be divided into the following types:

1. Cooling Towers. These require hoisting of sand, but may be arranged to discharge directly into storage hoppers, provided there is sufficient head room. Internal baffles must be provided. If sand is required to flow by gravity only, baffles should preferably be arranged helically to maintain the momentum of the sand rather than in zig-zag fashion, where the momentum is reversed on every step. If forced draft is provided—and in all cases except towers using water-cooled baffles for dry sand this is essential—an effective dust catcher must be fitted to collect the fines extracted. This catcher may be arranged to discharge into containers for dust disposal or into the mill where the fines are added again to the sand as required.

Cooling towers are suitable for most types of sand, but trouble may occur from very plastic sand sticking to baffles. This may be overcome by using almost horizontal baffles, sand being moved by a scraper mechanism fitted to a central shaft.

The main points to be allowed for in the design are the cooling time in the tower and the rapid removal of saturated air to prevent condensation on the exhaust system.

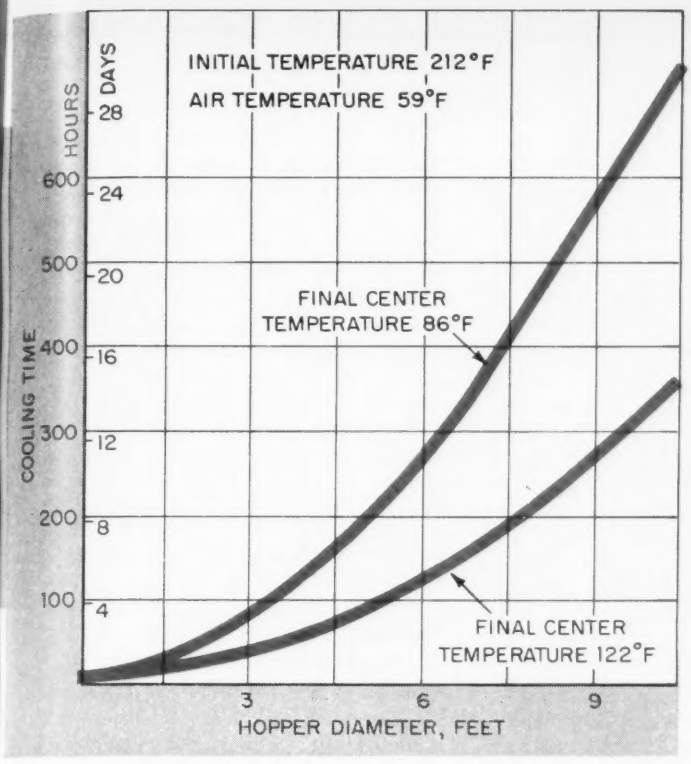
2. Rotating Coolers. The same design considerations apply here as in the case of cooling towers, except that additional power and structural work for rotation of the drum is required. While the cooling tower requires little floor space but considerable head room, the rotating cooler requires a large amount of floor space but little head room. In some cases it may be advantageous to combine the functions of a rotating sieve with that of a cooler and fit the entire assembly directly on top of a hopper. To be effective, coolers should be large, so that the last arrangement would be suitable only for a large hopper.

Such coolers are available commercially and types have also been described in which the bottom part of the cooler is immersed in water.

3. Water-cooled Belts. If hot sand has to be moved some horizontal distance it may be convenient to use a water-cooled steel band conveyor. To be most effective such steel bands should be constructed horizontally, though the erection of sloping steelbands is possible.

4. Other Equipment. At various times miscellaneous equipment such as spinning disks or aerators have been suggested, but the cooling time in these units is not sufficient for effective cooling, although they have some cooling action. Other possibilities are the immersion into hoppers or other parts of the sand system of heat exchangers, using a refrigerated medium. Apart from their high maintenance and installation costs they would also impede sand flow.

Cooling Core Sand—Core sand should be cooled after drying to about 85°F, although slightly higher temperatures may not be detrimental. The ini-



tial temperature is high—with some types of driers it is 600 to 750°F—but since there is little or no bond, the sand does not pack.

The most obvious cooling equipment are the pneumatic hoist and the cooling tower. Design of the first is generally determined by the air required for movement of the sand which appears to be satisfactory for cooling as well. However, if the plant layout permits cooling by water-cooled baffles in a tower, this would be a most efficient means. Such an arrangement would be economical in floor space because the sand ejected from the drier could be hoisted by a continuous bucket hoist into the cooler and dropped directly into a hopper. If the drier can be arranged at a high level, sand could drop directly from the drier into the cooler. A particular advantage of the baffle cooler with this type of sand is that there is no danger of sand sticking to baffles and, since the sand is dry, there is no condensation problem with the cooling plant.

Baffles must be arranged so that sand flows as evenly as possible over them and the total cooling time is sufficient to allow the heat to diffuse through the grains. Since there is little or no agglomeration of grains in this sand, cooling time can be restricted to that corresponding to the grain size of the major portion of the sand that is undergoing cooling.

Cooling Steel Foundry Sand—The main characteristics of steel foundry sand are the widely and rapidly fluctuating temperatures of the sand as received from the knockout, and a comparatively low moisture content. There is some tendency to pack. The sand should retain some moisture to maintain a satisfactory structure of the clay bond. Initial temperature of the sand may be taken as over 212°F.

Water sprays fitted with automatic control actuated by an arm sliding on the conveyor belt, so that water is turned on if sand is on the belt and the arm lifted, have been installed frequently. These are not always successful because the control cannot differentiate between hot and cold sand, which is also occasionally passed through the knockout. In the latter case sand is excessively moistened, impeding its flow. An automatic moisture control device is unlikely to be successful because the moisture content on a shakeout belt fluctuates rapidly. The usual solution is an automatically controlled valve as described above, but controlled by a master valve operated manually by the shakeout operator.

Air flow should be provided by a suction fan discharging into a cyclone conveniently located for the discharge of fines. The fan may be either an axial-flow type or a radial-flow fan. All ducting and the cyclone must be given a rustproof coating because some condensation will occur.

Cooling Iron Foundry Sand—Generally the same considerations apply here as in the case of the steel foundry sand cooling plant, except that allowances must be made for the following:

a. Iron sand tends to be much wetter than steel foundry sand and condensation problems are more serious. A larger air volume therefore is required to prevent saturation of air in the exhaust system.

b. The fines consist to a large extent of coal dust, which must be returned to the sand at some point in the system, preferably in the mill.

c. Iron foundry sand tends to pack more than steel foundry sand.

d. The average temperature of the sand is usually lower.

These methods suggest themselves as the most suitable:

1. A system consisting of shakeout belt with magnetic separator, bucket hoist, cooling tower and rotary bottom hopper feeding into a continuous mixer would be the most compact arrangement, provided the head room permits. For a lower head room the hopper may be at ground level discharging into a skip hoist feeding a batch mixer.

2. If the mixer is situated some distance from the shakeout, a system consisting of belt with magnetic separator, bucket hoist feeding an aerator to provide partial aeration, and water-cooled belt at high level leading directly to the main storage hopper is suggested.

Acknowledgements—The author is indebted to C. H. Kain of Lake & Elliot Ltd., Braintree, Essex, for facilities to carry out the experiments and permission to publish the data obtained, and to E. Bealing of the Steelband Conveyor & Engineering Co. Ltd., Birmingham, for data kindly supplied.

References

1. Heisler, *Transactions*, ASME, vol. 69, 1947, p.227.
2. Bamford, Shaw & Bright; BCIRA *Journal of Research and Development*, vol. 5, No. 7, 1954, p. 367.
3. Data supplied by the Steelband Conveyor & Engineering Co. Ltd., Dawlish Road, Birmingham, England.

Questions and Answers

Gas pocket occurring at top of soil pipe fitting caused by lack of vent . . . Suggest suitable dimensions of cupolas lined to 50 inches . . . Steel inserts in brake shoe supply wear resistance . . . Pin hole defect caused by gassy metal . . . Using all scrap mix is not good practice . . . Making chilled bushings

Pipe Fitting Cores Need Vent

QUESTION We are making soil pipe fittings and have run into trouble with some of the P-traps which appear to develop a gas pocket at the top of the curved section. We do not have any trouble with 90 and 45° els, Ys and Ts. Can you suggest a remedy?

ANSWER Prevention of the formation of the gas pocket at the top of the curved section of the P-trap is accomplished by using a generous size continuous vent through the center of the green sand core. In all probability at present vent rods are laid or pushed in as far as possible in each of the open ends, but they do not go through the curved portion. Without a free passage through that section, the gas generated rises to the top and forms the pocket on top of the casting. Method of venting the entire core depends on whether the core is rammed inside a shell pattern or in two separate coreboxes.

Where the shell pattern is used, core and mold are made at the same time, and the core is not removed and returned to the mold. In this procedure core and cope half of the mold are rammed first and rolled over. The drag is rammed and lifted off, and then the drag half of the pattern is removed. Drag is replaced, the assembly rolled over, and the cope and cope-half of the pattern removed. The cope then is replaced on the drag.

Core is not disturbed at any time and remains firmly resting in the prints and on the arbor extensions. To form a vent in this type of core a length of ½-in. rope is incorporated along the center line of the core and allowed to project through the prints at each end. The rope is pulled out just before the pattern is taken apart.

Process is simpler where the core is made in half coreboxes and booked. Previous to booking or bringing the halves together a vent channel is formed along the center line with a gate cutter or with a vent plate. One method is about as fast as the other, but the vent plate does a more finished job. The flat vent plate is fitted with dowels or dowel pins which fit over corresponding holes in the corebox and guide the half-round vent projection on the plate accurately into place along the center line of the half core face. Plate is formed of sheet steel, with the vent forming member of half-round rod welded in position.

Data on Dimensions of Cupola

QUESTION We operate a foundry in India and have decided to install an "egg-shape" furnace having the dimension of the melting zone 50 in. from brick to brick. As such a type of cupola is very uncommon in this region we would like to have the complete technical data for installation. For your information we have six cupolas with melting capacities of 7 to 8 tons per hr, and they are operated alternately. Only cast iron is being melted and our main products are post and telegraph stores, railway sleepers, brake blocks, manhole covers, soil pipe, etc.

ANSWER Your inquiry is not quite clear to us with your reference to an "egg shape" furnace and cupolas since there are two possible interpretations. We do know of one cupola installation which might be termed "egg" or oval shape, but dimensions are large, namely 72 x 102 in., and melting capacity is up to 35 tons per hr. Ordinary cupolas, as you know, are cylindrical and range up to 108-in. diam shells which are lined to 54 in. ID.

The other possibility is that you may be referring to the bessemer converter used for steelmaking. It often is mentioned as being "egg shape," and the large units used in steel mills for ingot making do have such a shape. However, the Tropenas type used in the foundry has straight sides. That is, the shape is cylindrical rather than ovoid. Since you mention that you produce only cast iron, we assume that you are contemplating installation of a larger cupola than those presently employed —specifically with a 50-in.-diam lining as compared with 42 to 45 in.

We can see no reason or advantage of making such a cupola other than cylindrical shape. Since the lining of brick or preferably block is 9 in. thick, the steel shell would have to be 68 in. ID or perhaps slightly larger—any space between lining and shell can be filled with dry sand or clay. The cupola should have eight tuyeres equally spaced, and they can be rectangular, about 5 in. high and 10 in. long, or round and 8 in. in diam. There is no fixed distance for the height of the tuyeres above the sand bottom or the bottom plate.

If the cupola is tapped continuously —that is, the taphole is left open all the time—the tuyeres may be only a few inches above the sand bottom since there is no iron held in the well or reservoir, and additionally a lower coke bed can be used. With intermittent tapping the tuyeres must be high enough to hold the amount of iron melted between openings of the taphole. With a 50 in. ID the well will hold about 205 lb iron per inch of height. Tuyeres should be located from 4 to 6 in. above the slag hole opening.

Recommended height of the charging door above the bottom plate is 16 to 22 ft. A cupola lined to 50 in. should melt about 10 tons per hr with a coke to iron ratio of 1 to 8, and the air supply should be 6250 cfm.

For detailed information relating to cupolas and operating characteristics, we suggest you get a copy of *The Cupola and Its Operation*, published by the American Foundrymen's Society.

Manufacture of Brake Shoes

QUESTION We operate a foundry in Japan and would like to have some information on manufacture of brake shoes for electric railway cars. We would like to know the following: Adequate range of chemical components. Microstructure. Mechanical properties such as hardness, tensile strength, abrasion properties, etc. Effect of tellurium, if added.

ANSWER Production of brake shoes for railroads and railways is a specialty operation, and not much information is available. So far as we know, the faces of the brake shoes are not chilled. Wear resistance to braking action is accomplished by use of steel inserts in the operating face of the shoes. In the case of lighter shoes used on cars, the insert is formed of several thicknesses of

coarse wire mesh or "expanded" sheet mesh (similar to that used in plastered-wall construction).

Face of the shoe is made in the drag and, of course, the insert material is curved to the same radius and placed on the drag face. Molten metal is poured into the mold and penetrates through the mesh material. Iron composition contains 1.25 to 1.40 per cent Si, 3.25 per cent TC, 0.50 per cent max P, and 0.5 to 0.7 per cent Mn.

In the case of heavier shoes such as used on locomotives, hard steel inserts, square or round in cross section, are set on the drag face instead of using the mesh inserts. A shaped piece of heavy perforated steel plate is wired in the cope mold to form the back of the shoe.

Encounters Pinhole Defects

QUESTION We are sending you a gear casting with which we are having trouble not previously experienced —small holes under the skin. Our cupola was lined a few weeks ago and this casting was poured on the fourth tap of about 2000 lb of iron.

ANSWER Fractured sections of the gear submitted for examination are permeated with small holes, usually termed pinholes in the foundry. Holes are somewhat elongated in shape, have bright shiny interiors and are located mainly just under the surface or skin. To us this is an indication of metal which has been gassed in the molten state. Generally such gassing is caused by water vapor (hydrogen) which is held in solution during the molten state and ejected as the metal solidifies. However, due to the formation of a solid skin at the mold interface, the gas cannot escape and is concentrated just under that skin.

Possible sources of gassing are damp or green cupola lining, sand bottom, cupola spout and pouring ladle. It hardly seems possible that a new lining after three weeks would cause the trouble, but with short heats it may not be dried out properly. Likewise, it does not seem logical that the sand bottom or the cupola spout would still be damp and cause trouble on the fourth tap—unless by that you mean that is the fourth day the cupola has been used, and the iron is the first melted. It may be that the pouring ladle was not dried out thoroughly, or that some one applied a wet patch to the spout just before pouring.

All-Scrap Mix Causes Trouble

QUESTION We operate a small aluminum foundry and pour mostly small castings which go into our own products. Cost per casting is a big factor so instead of using ingot metal as in the past we now are using mixed scrap such as pistons, cylinder heads, intake manifolds, washing machine parts such as tubs, gyrators, etc. We use a good grade of proprietary flux and keep our pressed steel ladles well painted and dry. We hold our sand moisture down to 6, permeability 6, strength 5.5 to 6.2. Fineness of the sand is 190. Melting is done in an oil-fired, 1200-lb reverberatory furnace and poured from 1275 to 1375° F depending upon the casting. However, in melting the scrap one heat will give all sound and perfect castings while the next heat will give castings with shrink spots, microporosity as well as being rough and brittle. We have tried pouring temperatures from 1200 to 1500° F when the trouble arises with no appreciable difference in the castings. Without a laboratory or one close by, are there any additions we might make to each heat of metal to make it more foolproof, or make our castings run consistently good and free from surface defects?

ANSWER After examining the two small castings forwarded to us and considering the information conveyed in your letter, we believe your main source of trouble is trying to melt a heterogeneous collection of scrap and pour it directly into molds. A secondary trouble lies in your sand condition.

A brief glance at the scrap materials being used shows that they might encompass some nine alloys ranging from 1.3 to 10 per cent Cu, 2.0 to 12.0 per cent Si, 0 to 1.0 per cent Mg, and 0 to 2.5 per cent Ni, not to mention Fe, Zn, etc. Not only that, but the sizes and shapes of the various materials make it extremely difficult to exert any semblance of melting control.

We recommend that you melt down the scrap and pour it into ingots or pigs, and use those for melting down and pouring into castings. Best procedure would be to form a molten heel in the bottom of the furnace, using the heaviest and most compact scrap for that purpose. Use your present flux for a cover or one composed of sodium chloride and calcium fluoride or cryolite in the ratio of 85:15. Then the lighter scrap is added—pushing it into the molten bath so it will dissolve rapidly. During the addition see that the bath remains highly liquid. If it tends to become pasty, stop scrap additions. When the furnace is full, carefully skim, and pour into ingots—leaving enough metal in the furnace to form a heel for the next cycle.

Instead of melting down all the scrap into ingots, you could try heats composed of 60 to 70 per cent ingot and the remainder scrap which is charged with the lighter section scrap on the bottom of the furnace.

While the castings sent to us are rather small to provide a definite opinion, we believe the defects marked are blows rather than shrinks, and since the castings also show a rough surface, the trouble might be due to high pouring temperature rather than the sand condition. However, poor sand mixing resulting in the formation of "sand balls" will cause such blows.

Surfaces of the castings seem somewhat rough for the section thickness and fineness of the sand. It occurs to us that this might result from poor screen or grain distribution—that is, there is sufficient coarse material with a lot of fine material to give the indicated fineness number. With such sand the coarse material would tend to protrude, giving a rough surface. Possibly you would be better off to go to a finer sand, but before changing, it will be advisable to experiment with small batches secured from your sand supplier until you get the best results.

Bushings in Permanent Molds

QUESTION Can you give us or tell us where we can secure information on producing bronze bushings in permanent or semipermanent molds? They are the usual 12-in. standard length with various outside and inside diameters. We understand that such bushings are made in your country in iron molds using dry sand cores.

ANSWER Probably the best procedure for making solid or hollow bushings in metal molds is described in *How To Make Improved Chill Cast Tin-Bronzes* published by Tin Research Institute. It points out that technical conditions for success are 1) the use of a flux to remove reducing gases absorbed during melting and to dissolve harmful oxide skins, 2) use of a controlled amount of deoxidant to remove excess oxygen before pouring, 3) control of the method and rate of pouring to eliminate shrinkage, and 4) preparation of molds and cores to prevent absorption of gas during casting.

Flux recommended contains two

parts sodium silicate (Anhydrous, powdered, 1:3½) and one part cupric oxide or 1½ parts black copper rolling mill scale. Preferably the two materials are mixed together, fused to a glass and crushed to suitable size. If the flux in powder form is used, it must be dried thoroughly before charging in the crucible. Flux is charged into the crucible with the metal in these ratios: 2 lb for up to 100-lb charge; 3¼ lb from 100 to 200-lb charge, and 4½ lb for 200 to 300-lb charge.

After the metal is molten, the flux is mixed in thoroughly and the metal temperature raised to about 2300° F. Then flux is thickened by addition of dry sharp sand and removed. The deoxidant (15 per cent phosphor-copper) is added in an amount ranging from 5 to 10 oz per 100 lb of metal. While this may seem high, it should be remembered that the metal melted under an oxidizing flux contains more oxygen than ordinarily is the case.

Pouring rates should be the minimum which will fill the mold without cold shuts. Critical rates depend upon the size of the bushings and the tin and phosphorus contents. Rate of pouring is controlled by use of a refractory - lined pouring cup or tundish—preferably a clay-graphite type suitably drilled for the type of bushing. Solid sticks are poured through a single hole, while core bushings are poured with multiple streams spaced equidistantly and midway between core and mold. Two holes are sufficient for bushings up to 2 in. external diam; four holes for 2 to 4 in., and six holes for 4 to 6-in. diam.

Recommended pouring rate is given by the formula R equals KP where R is the pouring rate in lb per minute, P is the periphery of the mold cross section in inches, and K is a constant. In case of core bushings use the periphery of the mold plus the periphery of the core. For example, in case of a 2-in. stick with a 1-in. hole, P equals 2 times 3.14 plus 1 times 3.14 or 9.42. The constant K is based on composition as indicated below:

Sn Content	P Content		
	Under 0.15	0.15 to 0.5	Over 0.5
	K	K	K
3-7	2.6	1.9	1.6
7-12	1.9	1.6	1.3
Over 12	1.6	1.3	1.0

Pouring rates obtained with standard pouring apertures 1 in. long of the diameters shown, using standard temperatures, are:

Hole diam., in.	¼	5/16	3/8	7/16	½	9/16	5/8
Rate, lb per min.	32	16	12	10	8	6	4

Standard pouring temperatures are 2192 to 2282°F for phosphor bronzes; 2150 to 2240°F for gun metal, and 2082 to 2192°F for leaded bronzes.

Mold and pouring cup should be positioned so that the metal does not strike either the mold wall or core. Mold or core wash should not provide a source of water vapor. Molds should be heated to about 212°F, and best results are obtained if the mold wall is sprayed lightly with thick resinous body-aluminum paint containing not less than 20 per cent aluminum.

Best core for cored sticks up to 2 in. internal diam is an iron rod with a smooth machined surface, tapered 1/32-in. on the diameter per ft. It is wrapped with one or more thicknesses of asbestos paper to give a total radial thickness of 0.01-in. per in. diam of the core. Paper may be moistened with water gum or a core wash composed of 5 per cent aluminum powder, 2 per cent dextrine and remainder water. It is sealed on with dextrine gum or with core wash which is brushed thinly over the whole wrapped paper.

Core must be baked for at least 15 minutes at 570°F or higher and used while still rather warm. To remove the core the casting is immersed in water, which softens the paper. For larger cored castings a cylindrical iron core without paper wrapping is used. Core is split into four segments, and a layer of asbestos paper ⅛-in. thick is inserted between each segment at the outer ends. Core surface is dressed with the aluminum paint.

Trouble With Porous Castings

QUESTION We are having difficulty producing aluminum alloy castings without evidences of porosity. Manually controlled, oil-fired furnaces are being used, and we believe we do not have proper control of combustion conditions. Can you make suggestions for remedying that situation? We pour light and heavy castings from the same pot, and have most trouble with the heavy ones. Light castings usually are polished. Our sand is No. 0 Albany and we watch the moisture content closely. We also employ a proprietary degasifier and a cover.

ANSWER Elimination of porosity involves considerable attention to details and possibly something is being overlooked. You mention that you are using manually controlled burners, and perhaps the operators are doing too much tinkering. We believe that proportioning burners would eliminate some trouble from that source by instructing the operators to leave the burners alone after they have been set properly. Perhaps you might have to take away the handles or lock the valves.

An Orsat instrument should be used to determine if the furnace atmosphere is reducing, oxidizing or neutral. However, many claim that the simple method of passing a cold, clean piece of slab zinc through the flame will give a good indication of combustion conditions. If the zinc turns black or shows a soot deposit, the flame is reducing and lacks sufficient oxygen for proper combustion. When the zinc surface remains clean, the flame is neutral or slightly oxidizing, and when a straw-yellow deposit occurs, the flame contains about 0.5 per cent oxygen, the desired condition.

You do not mention whether you use any temperature control instruments; if not, it will be worthwhile to get one and use it. Undoubtedly you know that the higher the temperature to which aluminum is heated the greater the gas pickup, and the longer it remains in the furnace the same thing occurs. Pouring light and heavy castings from the same crucible is not recommended. Light castings usually are poured at higher temperatures than are heavy castings, and best results are obtained when the aluminum is heated to a temperature just sufficiently high to pour the given section.

Watch how you handle the molten metal. It should not be stirred violently, and should enter the sprue without splashing or agitation. Lip of the crucible should be as close as possible to the sprue opening to prevent entrainment of air in the metal stream. Gating systems of the castings must be designed so that the molten metal is admitted to the cavity with minimum agitation and turbulence. Investigation shows that runners in the drag and gates in the cope give best results. Multiple gating permits lower pouring temperatures as well as rapid filling of the mold cavity.

Mention of use of a degasifier and cover raises the question of whether these materials are kept dry and used according to the manufacturer's directions? Some degasifying agents tend to pick up moisture when left exposed to the atmosphere and will not function properly in that condition. Covers will prevent escape of gases from the metal as well as keeping them out. Try melting without use of the cover, and see whether there is any difference in the condition of the metal.

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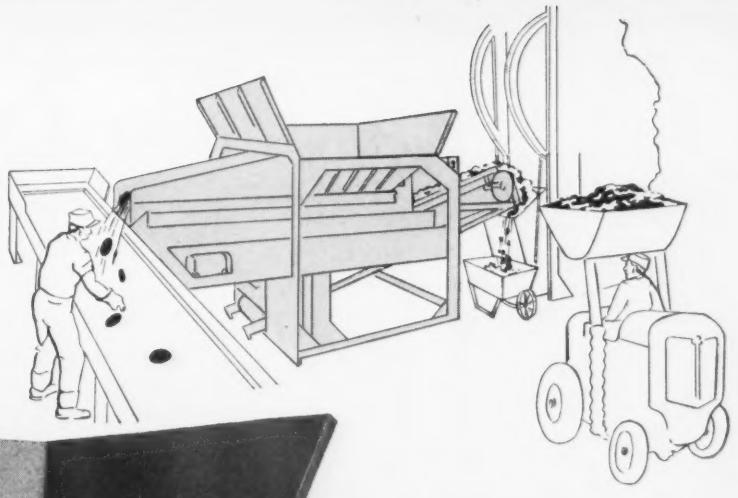

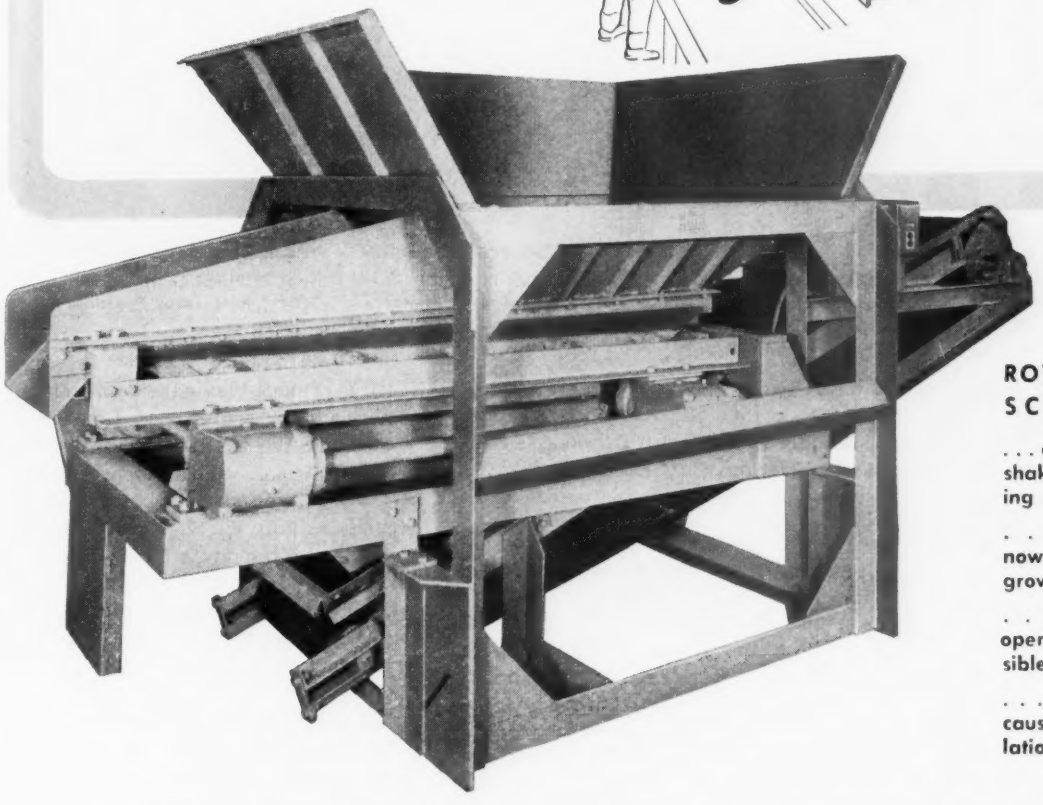

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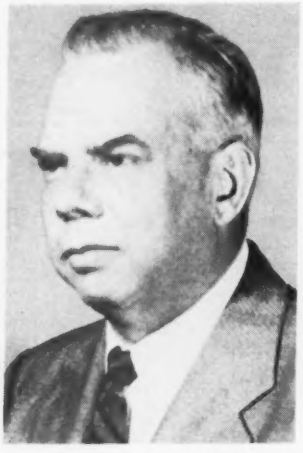


BEAUFORD E. GAVIN
. . . becomes plant mgr.

ARTHUR P. GUIDI
. . . assistant to plant mgr.

PETER D. HUMONT
. . . joins Texas Foundries Inc.

W. W. FLAGLE has retired as manager of the Indianapolis plant, National Malleable & Steel Castings Co., Cleveland. Mr. Flagle joined the company in 1918 after attending Case Institute of Technology and Western Reserve University. He worked in research, sales and inspection, and in 1938 became superintendent of the Sharon, Pa., plant, and later general superintendent. In 1948 he was transferred to Indianapolis as manager. **Beauford E. Gavin,** who has been assistant manager of the Indianapolis plant since 1948, has succeeded Mr. Flagle as manager there. A graduate of Purdue University, he joined the company in 1930, became plant engineer in 1934 and general superintendent in 1943.

Arnold J. Herrman was elected executive vice president - secretary, American Cast Iron Pipe Co., Birmingham. **Carl Farlow** was named chief engineer, **Sam F. Carter,** assistant works manager, **Ralph Carlson,** melting superintendent, and **James W. Moore Jr.,** assistant melting superintendent. **W. W. McCulloch** has become sales manager, and **T. E. Rybka,** assistant sales manager of special products. **J. T. Vann,** assistant works manager, will succeed **Dr. James T. MacKenzie** as technical director when the latter retires in April. **C. K. Donoho,** chief metallurgist, will become assistant technical director and metallurgist.

Henry Bryk was appointed superintendent of the metal department, Metal & Thermit Corp., New York, with headquarters at the Carteret, N. J., plant. Since 1946 Mr. Bryk was associated with Arwood Precision Casting Co., Brooklyn, N. Y., where he was plant manager.

Arthur P. Guidi was appointed assistant to the plant manager, Texas Foundries Inc., Lufkin, Tex., to work on special projects in the malleable division. A graduate of University of Cincinnati, he worked for Cincinnati Milling Machine Co. during his cooperative engineering course. Mr. Guidi joined Texas Foundries last year. **Peter D. Humont,** formerly field service engineer, Eastern Clay Products Co., Chicago, has been appointed sand supervisor of Texas Foundries. He was graduated from Western Michigan College and was previously associated with Murray Body Corp., Detroit, Harmon Gray Iron Foundry, Waterloo, Iowa, and John Deere Malleable Works, Moline, Ill. **Robert S. Bradshaw Jr.** continues as plant manager, and **Robert Medford,** as sand foreman at Texas Foundries.

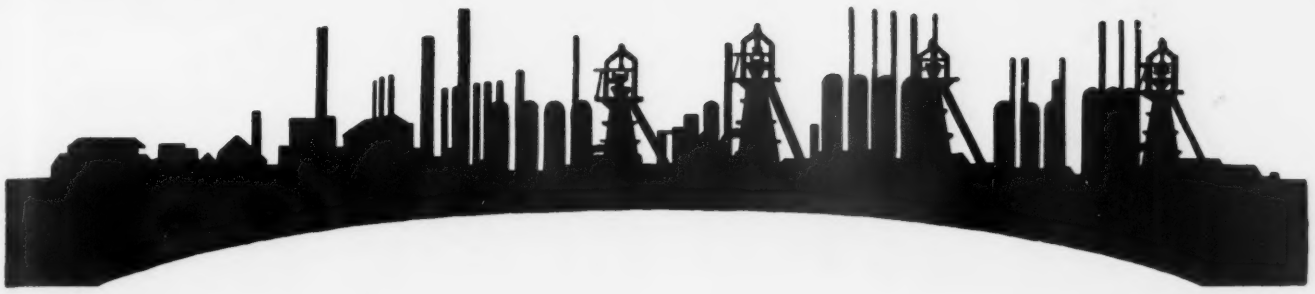
Joseph Solari, a director of Great Lakes Carbon Corp., New York, was recently elected executive vice president of the company. Prior to joining Great Lakes he was associated for many years with Peabody Coal Co., Chicago.

E. B. Suydam was appointed president, Linde Air Products Co., New York, succeeding **T. D. Cartledge,** who continues as a vice president of Union Carbide & Carbon Corp., the parent company, there.

W. G. Frank was named president, American Air Filter Co., Louisville, succeeding **W. M. Reed,** who has become chairman of the board. **Ben R. Shaver** was made vice president-treasurer, and **E. G. Mason,** secretary. Mr. Frank was chief engineer, National Air Filter Co., Chicago, which was consolidated with American Air Filter in 1929. Until recently he was executive vice president of the parent company. Mr. Reed, founder of William Reed Engineering Co., later Reed Air Filter Co., became president of American Air Filter when it was organized through a consolidation of five air filter companies. Mr. Shaver joined the company in 1942 as secretary-treasurer. Mr. Mason was secretary-treasurer, Herman Nelson Corp., Moline, Ill., which AAF absorbed in 1950.

H. A. Robinson, for many years in charge of pig iron sales at New York for the Republic Steel Corp., Cleveland, has retired and will live in Fort Lauderdale, Fla. He was with the New York office of the Donner Steel Co. when it was acquired by Republic in 1930. Previously he was affiliated with Rogers, Brown & Crocker Bros. at Pittsburgh, and before that with Midvale Steel & Ordnance Co., Philadelphia.

Robert J. Wright was appointed staff engineer for the dust control department, American Air Filter Co., Louisville, with headquarters in Cleveland. Mr. Wright attended Western Reserve University and Case



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609 Bona Allen Building, Atlanta 3, Ga.; 230 North Michigan Avenue, Chicago 1, Ill.; First National Building, P. O. Box 538, Cincinnati 1, Ohio; 1659 Union Commerce Building, Cleveland 14, Ohio; 1203 Ford Building, Detroit 26, Mich.; P. O. Box 335, Duluth 1, Minn.; 412 Guaranty Building, Indianapolis 4, Ind.; 407 Foshay Tower, Minneapolis 2, Minn.; 70 Pine Street, New York 5, N. Y.; 1500 Walnut Street Building, Philadelphia 2, Pa.; 1910 Clark Building, Pittsburg 22, Pa.; 796 Arcade Building, St. Louis 1, Mo.

Woodward Iron Company

WOODWARD, ALABAMA

Independent Since 1882

ANTHONY DeYOUNG
. . . retires, Whiting Corp.

ERNEST G. SWIGERT
. . . manufacturers' group v. p.

F. W. NEVILLE
. . . becomes purchasing mgr.

RICHARD C. NEWBOLD
. . . George F. Pettinos v. p.

Institute of Technology, and was formerly resident engineer, W. W. Sly Mfg. Co., Cleveland.

Anthony DeYoung, for many years advertising manager for Whiting Corp., Harvey, Ill., is retiring March 1. This will follow 45 years of continuous employment with the Whiting organization. Beginning as a stenographer in 1910, he was for several years (interrupted by service in World War I) secretary to the sales manager, at the same time completing an evening course in advertising. After the war he was given charge of the advertising department and has continued in that capacity, as well as assistant to the sales manager.

Ernest G. Swigert, president, Hyster Co., Portland, Oreg., was elected vice president of the National Association of Manufacturers at its recent annual meeting in New York. He served as a director of the association for a number of years and as regional vice president last year. A graduate of Harvard University, he founded the Hyster Co. in 1929 and has been president since that time.

Alan R. Moore recently joined Superior Steel & Malleable Castings Co., Benton Harbor, Mich., as an engineer in the product development laboratory. Mr. Moore, a native of Scotland, attended Heriot-Watt College, Edinburgh, and was associated with Charles Henshaw & Sons, there, prior to going to London, Ont., where he was assistant superintendent, Empire Brass Mfg. Co., Ltd. **Paul R. Hennum** was named personnel manager, and **J. K. Hutchens,** special product salesman, with Superior Steel. Mr. Hennum, a graduate of University of Minnesota, until recently was personnel manager, National Malleable & Steel Castings Co., Indianapolis. Mr. Hutchens spent 4 years at Wright Field, Dayton, O., as test pilot and product engineer.

F. W. Neville was appointed purchasing manager, C. O. Bartlett & Snow Co., Cleveland, succeeding **C. Ralph Willson,** who has retired. Mr. Neville joined the company in 1948, after graduation from Case Institute of Technology, and served as production manager since 1952.

Richard C. Newbold, formerly president, Lehigh Navigation Coal Sales Co., Philadelphia, was named vice president-sales, George F. Pettinos Inc., there.

Harry J. Behnke, for the last 5 years manager of the by-product coke division, has been appointed manager, Republic Coal & Coke Co., Chicago, succeeding the late Walter E. Oelschlaeger.

Harold Lind, Midwestern sales representative, Beardsley & Piper Division, Pettibone Mulliken Corp., Chicago, has retired after 31 years with the company. He joined Beardsley & Piper as a service engineer, and became a sales representative in 1937. Previously he was associated with Tarrant Foundry Co., Chicago. **Harold C. Weimer,** formerly chief

ALAN R. MOORE
. . . product development

PAUL R. HENNUM
. . . personnel manager

J. K. HUTCHENS
. . . joins Superior Steel

HAROLD C. WEIMER
. . . Beardsley & Piper sales

Check List for your FOUNDRY NEEDS!

The STERLING Line:

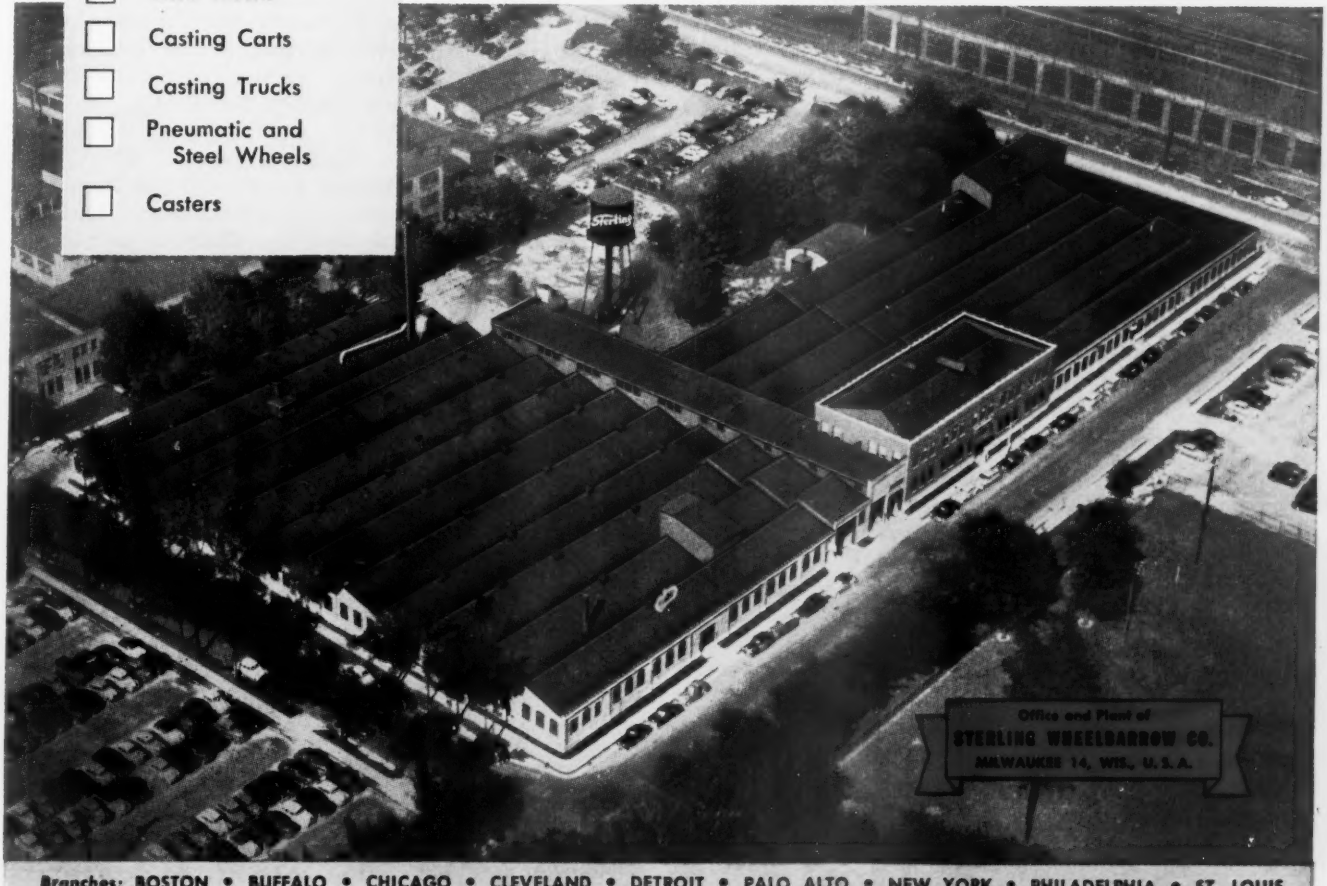
- ☐ Standard Flasks
- ☐ Heavy Duty Flasks
- ☐ Stack Molding Flasks
- ☐ Steel Flask Bars
- ☐ Flask Clamps
- ☐ Clamping Bars
- ☐ Pins and Bushings
- ☐ Steel Core Plates
- ☐ Bottom Boards
- ☐ Bands
- ☐ Upsets
- ☐ Slag Buggies
- ☐ Heavy Duty Wheelbarrows
- ☐ General Wheelbarrows
- ☐ Core Trucks
- ☐ Casting Carts
- ☐ Casting Trucks
- ☐ Pneumatic and Steel Wheels
- ☐ Casters

Progressive foundrymen, all over the world, look to Sterling for their flasks and other foundry needs. They KNOW, if the equipment comes from Sterling, it's soundly engineered and built to highest quality standards. So play safe. Always specify Sterling. Check the list for your current requirements. We'll gladly send you literature and prices.

It Pays to Specify

Sterling

because Sterling is TOPS in the Foundry Equipment Field.



Branches: BOSTON • BUFFALO • CHICAGO • CLEVELAND • DETROIT • PALO ALTO • NEW YORK • PHILADELPHIA • ST. LOUIS

Subsidiary Company: STERLING FOUNDRY SPECIALTIES, LTD., London, Bedford and Jarrow-on-Tyne, England

A 8342-1PC

MEN OF INDUSTRY

WILLIAM H. LEGGETT
. . . joins Acheson Colloids Co.

R. GRANT WHITEHEAD
. . . Schneible Co. sales mgr.

EDWARD R. COUCH
. . . Le Roi Division sales

RAYMOND F. HEIDEN
. . . AFS Chapter Chairman

layout engineer, has succeeded Mr. Lind as sales representative for the Midwestern territory.

William H. Leggett was appointed sales engineer, Acheson Colloids Co., Port Huron, Mich., to head the Rochester, N. Y., office, covering upstate New York. He succeeds **Edwin A. Lampman,** who has retired after 25 years with the company.

Walter A. St. Clair, for the past 3 years district manager, Mid-Central District, Hyster Co., Portland, Oreg., was appointed assistant sales manager, Eastern Industrial Truck Division, with headquarters in Danville, Ill.

Beverly W. Duncan, formerly chief metallurgist, Alloy Precision Castings Co., Cleveland, was appointed head of research and development, Misco Precision Casting Co., Whitehall, Mich. Previously he was plant metallurgist, Electro Alloys Division, American Brake Shoe Co., Elyria, O.

R. Grant Whitehead, formerly assistant to the sales manager, was named sales manager, Claude B. Schneible Co., Detroit. He worked for International Register Co. and Carnegie Illinois Steel Co. while in a co-operative study plan at Illinois Institute of Technology. After graduation in 1940 he joined Claude B. Schneible Co. and for 3 years worked on layout, design and field engineering. He served as production manager until 1944 and following military service rejoined the company.

Lewis J. Langeness was appointed sales manager, Wilshire Power Sweeper Co., Elgin, Ill. **Louis Wieringa** has succeeded Mr. Langeness as Central district manager.

Austin Goodyear was named executive vice president, Hewitt-Robins Inc., Stamford, Conn. Mr. Goodyear joined the company in 1941 and became production manager in 1947. He was transferred from production to sales in 1948 as assistant to the vice president-sales.

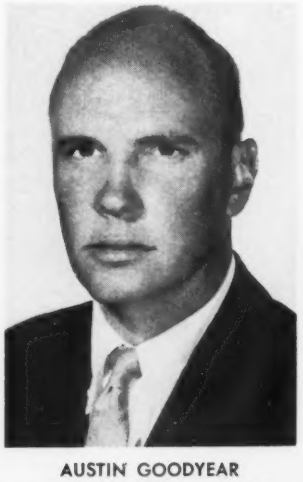
Edward R. Couch was appointed manager of stationary compressor sales, Le Roi Division, Westinghouse Air Brake Co., Milwaukee. Mr. Couch attended University of Pittsburgh, and prior to joining Le Roi last year as an assistant product sales manager, he was associated with Industrial Products Division of Westinghouse Air Brake Co.

Raymond F. Heiden, currently serving as chairman of the Central Illinois Chapter of the AFS, is foundry manager and treasurer, Galva Foundry Co., Galva, Ill. He attended Bradley University and following Navy service enrolled in the foundry apprentice training course at Caterpillar Tractor Co., Peoria, Ill., from which he was graduated in 1950.

Donald L. Shirley was appointed Pacific Northwest sales manager, Link-Belt Co., Chicago, with headquarters at the Seattle plant. Recently Mr. Shirley was district sales manager for the Seattle district. He has served with the company for

WALTER A. ST. CLAIR
. . . truck sales, Hyster Co.

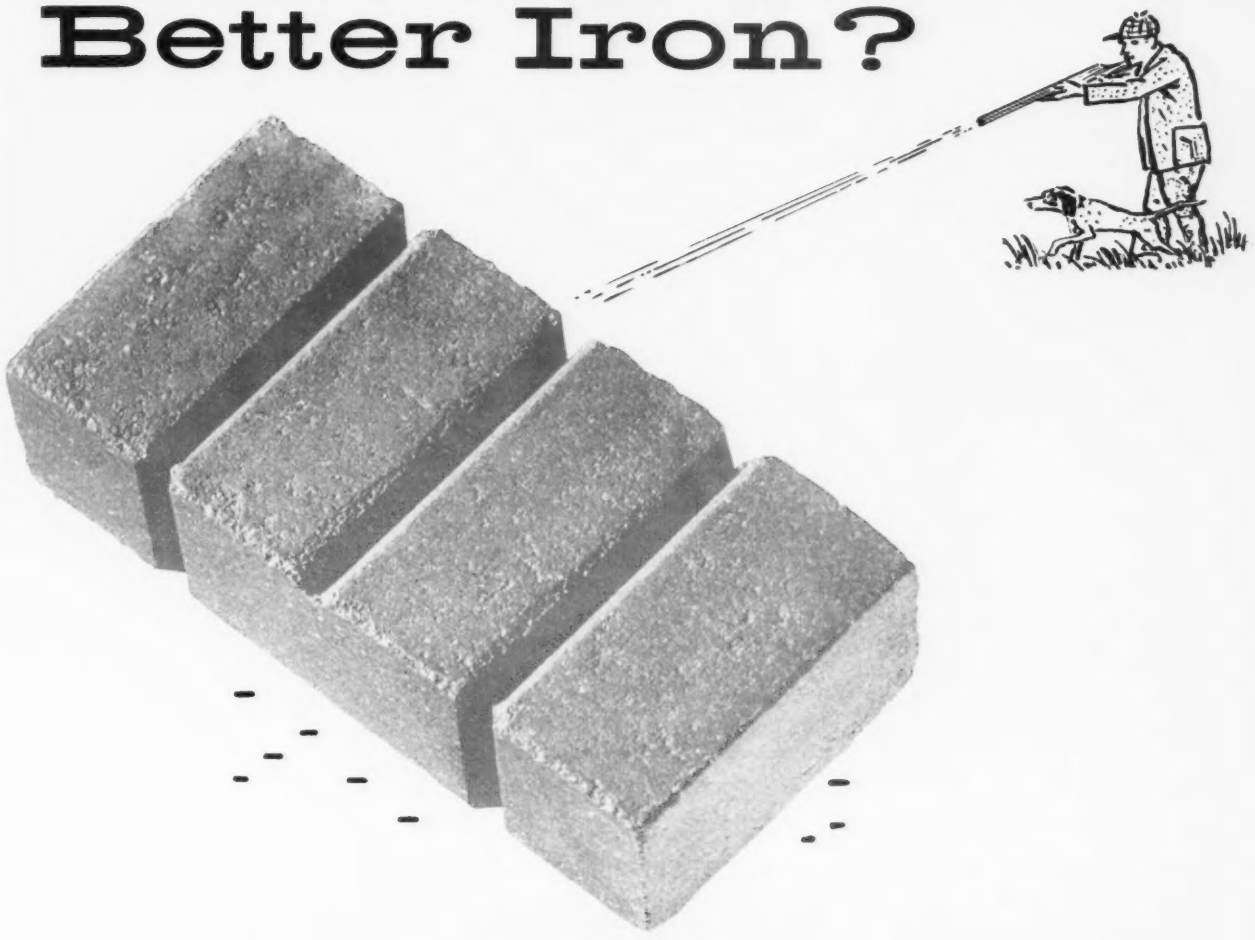
BEVERLY W. DUNCAN
. . . joins Misco Precision



AUSTIN GOODYEAR
. . . Hewitt-Robins executive

DONALD L. SHIRLEY
. . . Pacific Northwest sales

Shooting for Better Iron?



Use Famous CORNELL CUPOLA FLUX

• because it purifies the iron so that all the slag floats off through a chemical reaction in the molten iron. Drops are cleaner thereby saving you hundreds of dollars in digging out time. Castings have greater tensile strength and are uniformly hard throughout. Anyway you look at it, Famous Cornell Cupola Flux puts money in the bank for you by improving the quality of your gray iron castings and saving you production time.

Advantages of Famous CORNELL Aluminum and Brass Flux

- Makes metal pure and clean.
- Permits use of more scrap without danger of dirt, porous places or spongy spots, due to dirty metal.
- Thinner, yet stronger sections can be poured.
- Metal does not cling to the dross as readily.
- Crucible or furnace linings are kept clean and preserved.
- Cleanses molten brass (whether red or yellow) even when the dirtiest brass turnings are used.
- Saves considerable tin and other metals.
- Forms a perfect covering over the metal during melting, prevents oxidation and reduces obnoxious gases to a great extent.

Write for Bulletin 46-A

The CLEVELAND FLUX Company

1026-40 MAIN AVENUE, N. W. • CLEVELAND 13, OHIO

Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes—Since 1918

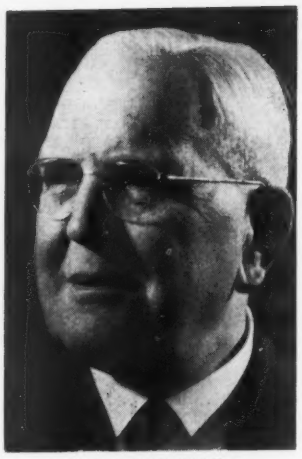
FAMOUS CORNELL FLUXES

Trade Mark Registered

over 30 years in Seattle, Portland, Oreg., Philadelphia and Indianapolis. **J. F. Strott,** Seattle, is general manager of the Pacific Northwest Division.

Arthur S. Klopf was appointed manager of marketing, American Gilsonite Co., Salt Lake City, Utah. A graduate of Marquette University, Mr. Klopf received a master's degree in metallurgical engineering from University of Wisconsin. Until recently he was general sales manager, Missouri Coke & Chemical Division, Great Lakes Carbon Corp., New York, at the St. Louis headquarters of the division.

Maj. Gen. Leslie E. Simon, U. S. Army, retired, formerly assistant chief of ordnance for research and development, U. S. Army Ordnance Corps, was appointed director of the Research and Development Division, the Carborundum Co., Niagara Falls, N. Y., succeeding **Harry C. Martin.** With the company 42 years, Mr. Martin will continue as a vice president of the company, handling special assignments for the president.



MAX VUILLEUMIER
. . . FTA Committee head

Max Vuilleumier, consulting engineer, Oerlikon Engineering Co., Zurich, Switzerland, became president of the International Committee of Foundry Technical Associations as of Jan. 1. Mr. Vuilleumier worked as a molder in Switzerland and attended the Royal Foundry Institute in Duisburg, Germany. He joined the Oerlikon firm in 1915 and became chief engineer of the gray iron and nonferrous foundries in 1920. Since 1953 he has been consulting engineer. He served as vice president of the International Committee of Foundry Technical Associations last year and has attended the International Foundry Congresses in Brussels, Atlantic City, Paris, Florence and London.

Edmund M. Wise was appointed assistant to the vice president-manager, Development and Research Division, International Nickel Co., New York. Mr. Wise was graduated from University of Wisconsin and joined the company in 1927. Since 1933 he was head of development and research activities in platinum metals and applied physics, in the New York office.

Frank L. Middleton, for 15 years New York sales manager, Ajax Metal Division, H. Kramer & Co., Chicago, was appointed assistant sales manager, to work out of division headquarters in Philadelphia. He has been associated with Ajax Division for 34 years.

J. C. Douglas was appointed a vice president, Electro Metallurgical Co., Division of Union Carbide & Carbon Corp., New York. A graduate of Georgia Institute of Technology, he joined the company in 1934. For the past two years he was manager of industrial relations.

A. J. Eckley has retired as manager of the Louisville branch office, Driver-Harris Co., Harrison, N. J. **Ralph J. Pastine,** since 1934 in the sales department of the home office in Harrison, has succeeded Mr. Eckley in Louisville.

Robert E. Peterson was appointed Pittsburgh district application engineer, Clark Controller Co., Cleveland. He was formerly associated with Monitor Controller Co., Cambridge, Mass., for 8 years, in sales and engineering capacities.

Murray I. Glickman recently joined the Boston office of Luria Bros. & Co., Philadelphia. Mr. Glickman attended Franklin and Marshall College and Harvard Business School.

Charles B. Price, since 1941 manager of the Pittsburgh district, Norton Co., Worcester, Mass., has retired after 39 years with the company. He entered sales work for the company in 1934.

Robert E. Wilkin was named vice president-director of sales, and a director, Hooker Electrochemical Co., Niagara Falls, N. Y.

Aluminum Foundry Industry Veteran Retires

FRANK VAN BOXEL has retired as assistant to the sand foundry manager of the Aluminum Co. of America, Cleveland. Few if any other men have been so actively identified for such a long period with the practical development of aluminum casting operations.

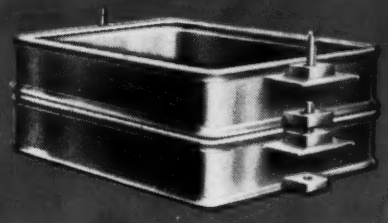
Mr. Van Boxel was with Alcoa for more than 37 years, although his foundry experience dates back even farther. In fact, it has been said that he was "weaned on a sprue and fed with a riser." His father, a life-long foundryman, in 1904 moved from his native Cleveland to Fremont, O., to join the Lincoln Stove & Range Co. Young Frank, recently having completed grade school, went with the same company. Seven years later with two other Fremont men as partners he established the Hotz Foundry.

In 1917 he joined the Aluminum Castings Co., forerunner of Alcoa's Cleveland works, as foundry foreman. Shortly after he was transferred in the same capacity to a new plant built to make castings for World War I Liberty engines. About ten years later he was made superintendent, and in 1947 he was appointed assistant to A. H. Hinton, foundry manager.

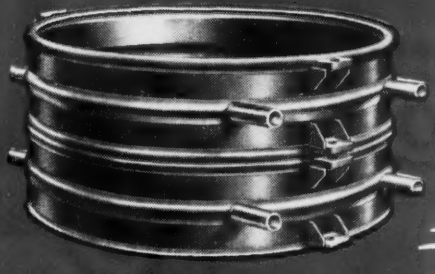
FRANK VAN BOXEL

Mr. Van Boxel played an important role in the development and production of such aluminum castings as automotive crankcases and cylinder blocks, architectural spandrels, bearings and torque converters, in addition to the varied military requirements of World War II. His grandchildren, rather than castings, will receive the major share of Mr. Van Boxel's attention in the future.

LOW FIRST COST
LOW OPERATING COST



6A—One man Flask for stacking.



108—Round two man Flask.

4A—Extra light weight, easy shake out.

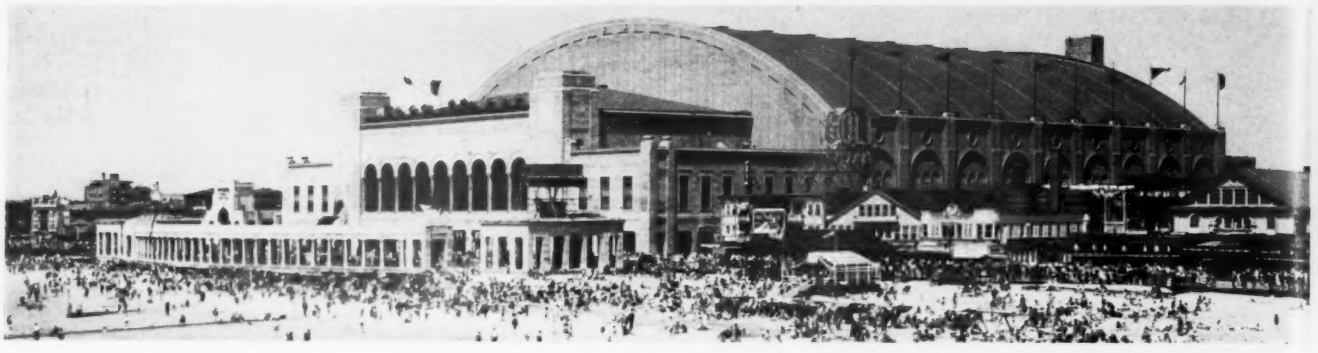
Divide the greater number of production hours given by a Shanafelt Flask into its low original cost, and you'll get a very happy answer. Shanafelt Steel Flask equipment has been proving its economy in American foundries for over 30 years. Check it for yourself. When you need new Flasks, just remember — SHANAFELT, CANTON, OHIO — and send us your inquiry. You'll like the price and you'll like the Flasks.

The combination of corrugated sidewalls and welded flanges makes a Flask with exceptional strength and rigidity. The size of the flanges and the thickness of the sidewalls are varied to suit the requirements. The Flask illustrated is 36" x 50" — 14" Cope — 12" Drag. Weight 1010# per set.

The SHANAFELT Manufacturing Co.

Serving the Foundry Industry since 1893

2600-2700 WINFIELD WAY N. E. • CANTON, OHIO



Atlantic City Convention Hall, where activities of the 1956 AFS Congress and Exhibit will be concentrated from Thursday through Wednesday, May 3-9

Plans Well Developed for

AFS CONGRESS and EXHIBIT

PLANS are rapidly taking shape for what promises to be an outstanding Congress and Exhibit of the American Foundrymen's Society in Atlantic City, May 3-9.

A large exhibit by companies dealing in foundry equipment, supplies and services in the huge Atlantic City Convention Hall is assured. By early in January 214 exhibitors had contracted for nearly 99 per cent of the main floor space.

While the convention opens on Thursday, May 3 and concludes the following Wednesday, no technical sessions are scheduled for Sunday, and the exhibits also will be closed that day. Hours for the Foundry Show on other days are: Thursday, 9 to 5:30; Friday, 9 to 5:30; Saturday, 9 to 12 and 2 to 5:30; Monday, 9 to 5:30; Tuesday, 9 to 5:30, and Wednesday, 9 to 5:30. Exhibits will be closed from 12 to 2 Saturday during which time the annual AFS business meeting and Charles Edgar Hoyt Memorial Lecture will be held.

Technical Sessions—The tentative schedule of technical sessions sponsored by the various AFS divisions is shown in the accompanying table. Meetings have been scheduled this year so that not more than four will be held simultaneously. First sessions start Thursday afternoon.

One feature of the technical program will be a symposium on metallography to be held Monday and Tuesday evenings. Two evening sessions also are scheduled for both the gray iron and sand shop courses. Saturday evening is reserved for the annual banquet and medal awards.

Foreign papers to be presented at Atlantic City will include the official paper from the Institute of British Foundrymen by Dr. D. V. Atterton on "The Carbon Dioxide Process." A second British paper, "Subsurface Blowholes and Their Association with Manganese Sulphide Segregation," will be from the British Cast Iron Research Association. Another paper from Europe will be "Present Knowledge of Hot Blast Cupola Practice in the Foundry," by Dr. Wilhelm Heinrichs.

TENTATIVE SCHEDULE OF AFS TECHNICAL SESSIONS

Thursday, May 3

2:30-5 p.m.—Gray Iron, Malleable, Sand, Brass and Bronze
8 p.m.—Gray Iron shop course

Friday, May 4

9-11:30 a.m.—Brass and Bronze, Gray Iron, Malleable, Pattern
12 noon—Brass and Bronze, Malleable and Education roundtable luncheons
2:30-5 p.m.—Light Metals, Plant Equipment, Sand
7:30 p.m.—Sand Division dinner
8 p.m.—Gray Iron shop course

Saturday, May 5

9-11:30 a.m.—Education, Industrial Engineering and Costs, Light Metals, Sand
12-2:30 p.m.—Annual business meeting and Charles Edgar Hoyt Memorial Lecture
3-5:30 p.m.—Brass and Bronze, Refractories, Malleable shop course

Monday, May 7

9-11:30 a.m.—Steel, Plant Equipment, Sand
12 noon—Light Metals and Gray Iron roundtable luncheons
2:30-5 p.m.—Heat Transfer, Gray Iron, Light Metals, Education
8 p.m.—Sand shop course, Metallography symposium

Tuesday, May 8

9-11:30 a.m.—Heat Transfer, Industrial Engineering and Costs, Pattern, Gray Iron
12 noon—Industrial Engineering and Costs, Safety-Hygiene-Air Pollution roundtable luncheons
2:30-5 p.m.—Steel, Safety-Hygiene-Air Pollution, Light Metals
8 p.m.—Sand shop course, Metallography symposium

Wednesday, May 9

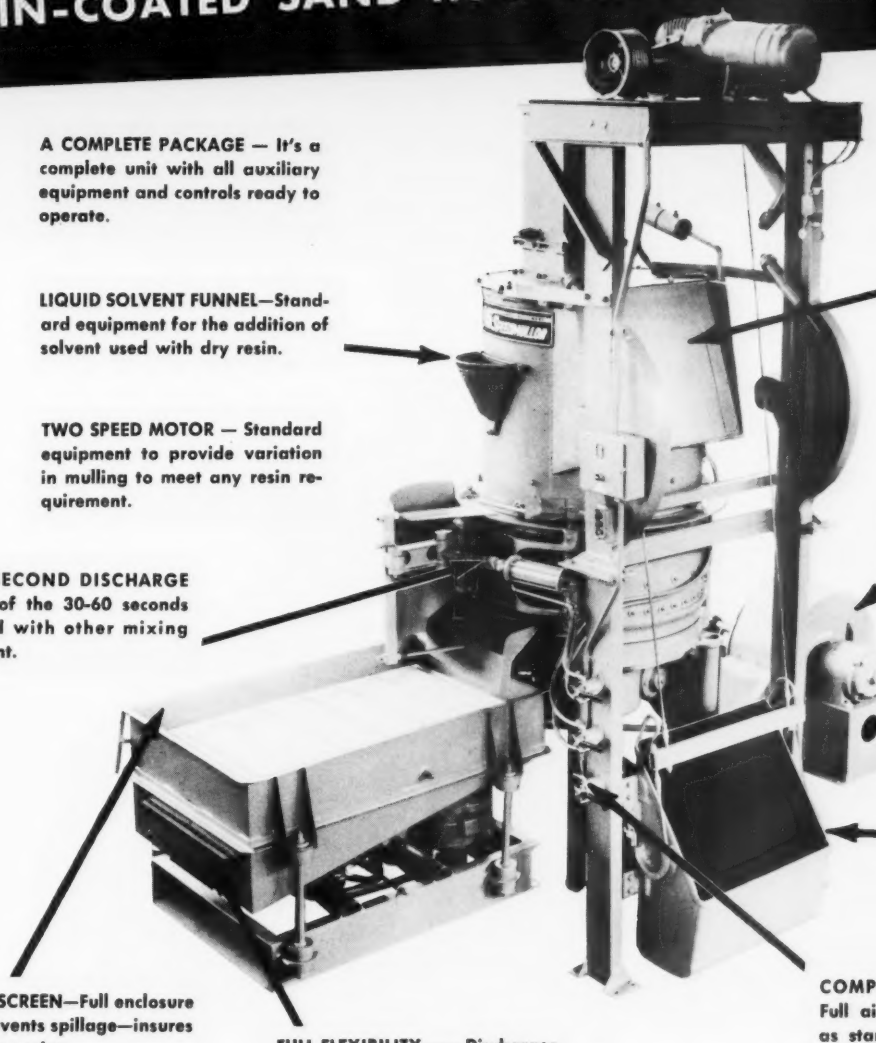
9-11:30 a.m.—Plant Equipment, Steel, Sand, Safety-Hygiene-Air Pollution

New Officers and Directors—The annual business meeting Saturday noon will be the occasion for election of officers and directors for the coming year. Frank W. Shipley, Caterpillar Tractor Co., Peoria, Ill., currently vice president of the society, has been nominated for the presidency to succeed Bruce L. Simpson, National Engineering Co., Chicago. Nominee for vice president is Harry W. Dietert, Harry W. Dietert Co., Detroit.

Nominees for the board of directors to serve three years are: Alex W. Pirrie, foundry superintendent, Standard Sanitary & Dominion Radiator Ltd., Toronto; Roger W. Griswold, Erie Malleable Iron Co., Erie, Pa.; Gerald R. Rusk, president, Freeman Supply Co., Toledo, O.; R. V. Righter, plant manager, Central Foundry Division, General Motors Corp., Danville, Ill.; Garnet P. Phillips, general supervisor, foundry research, International Harvester Co., Chicago; Herbert Heaton, foundry superintendent, Letson & Burpee Ltd., Vancouver, B. C.

Presentation of gold medal and honorary membership awards to recipients selected by the AFS Board of Awards will be made at the banquet. Selections of the board include: Prof. C. C. Sigerfoos, Michigan State University, the Thomas W. Pangborn Medal; James S. Vanick, International Nickel Co., the William H. McFadden Medal; Harold F.

COLD PROCESS, FREE-FLOWING, NON-CLUMPING, RESIN-COATED SAND IN 5 MINUTES INSTEAD OF 25



A COMPLETE PACKAGE — It's a complete unit with all auxiliary equipment and controls ready to operate.

LIQUID SOLVENT FUNNEL—Standard equipment for the addition of solvent used with dry resin.

TWO SPEED MOTOR — Standard equipment to provide variation in mulling to meet any resin requirement.

EIGHT SECOND DISCHARGE Instead of the 30-60 seconds required with other mixing equipment.

NO-SPILL SCREEN—Full enclosure design prevents spillage—insures uniform screening.

FULL FLEXIBILITY —— Discharges perfectly coated, free-flowing, non-clumping sand into air conveying system or onto conveyor.

FULL SEALING FLOP GATE — Full perimeter seal around flop gate opening eliminates dust, provides most effective operation.

VARIABLE VOLUME BLOWER — Solvent drying equipment actually injects air through the mass at a controlled rate for most efficient solvent evaporation. Air volume is infinitely variable from zero to maximum.

SPECIAL SKIP BUCKET — Special wide design with low loading height insures fast easy loading.

COMPLETE WITH CONTROLS Full air controls are supplied as standard equipment. Mulltrolmatic automatic controls — to control every phase of the operation — are available as optional equipment.

NEW CP SHELL SPEEDMULLOR SLASHES COSTS FOR SHELL MOLDERS

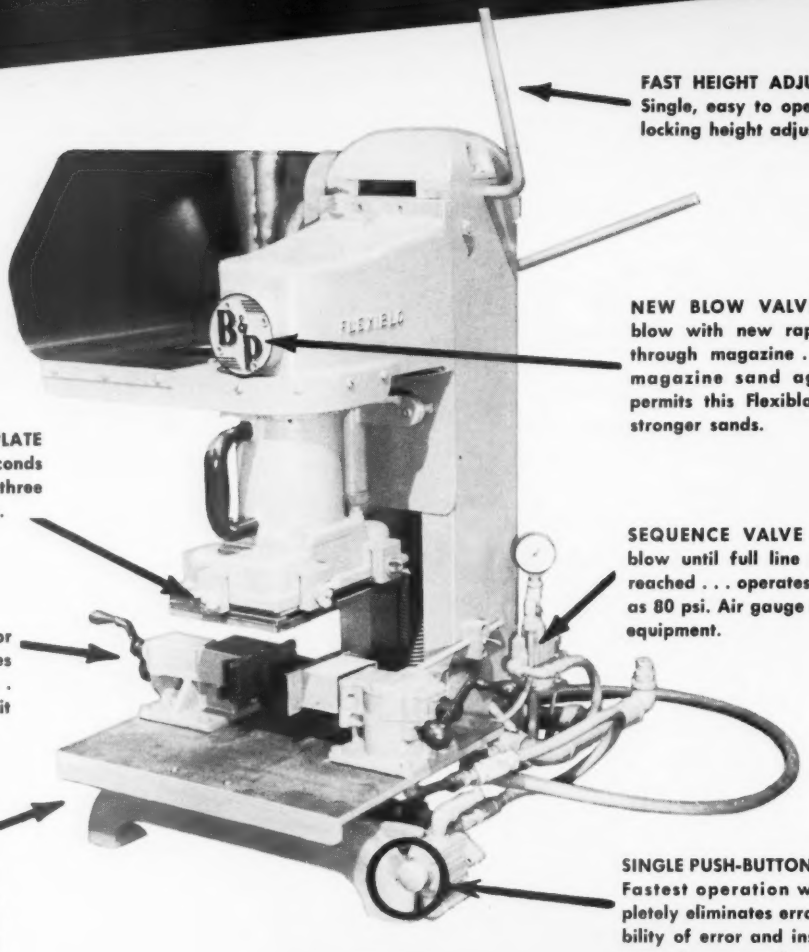
Now, free-flowing, non-clumping, resin-coated shell molding sands may be prepared by the cold process in the new Model CP Shell Speedmullors in one-fifth the time required with other mixing equipment. Available in six sizes with capacities of from 2,000 to 9,000 pounds per hour, these new Shell Speedmullors operate on total cycle times of approximately five minutes on all typical resin-coated sand mixtures. These units are available as complete packages with all auxiliary equipment and controls ready to do the whole job on installation.

For the first time the operator has full control over all of the variables of cold process preparation. Three position mullor wheel spacing and two speed mullor motor provide a wide range of variation of mulling pressure.

In addition, the volume of air blown *through* the sand mass (only the Shell Speedmullor provides this feature) may be varied from zero to maximum to meet requirements. These new units handle either liquid resin additions or solvent and dry resin additions. Mulltrolmatic — the ultimate of automatic control — is available to control every phase of the operation.

For full information and prices write directly to *BEARDSLEY & PIPER, Division Pettibone Mulliken Corporation, 2424 North Cicero Avenue, Chicago 39, Illinois.*

NOW! PUSH-BUTTON COREBLOWING FOR THE SMALL JOBBING FOUNDRY...



FAST HEIGHT ADJUSTMENT — Single, easy to operate, quick locking height adjustment.

A COMPLETE PACKAGE — This new B & P Flexiblo comes fully equipped ready to operate . . . no extras to buy.

NEW BLOW VALVE — Faster blow with new rapid exhaust through magazine . . . to keep magazine sand agitated . . . permits this Flexiblo to handle stronger sands.

QUICK CHANGE BLOW PLATE Blow plates changed in seconds ...just necessary to loosen three hand-turned thumb screws.

SEQUENCE VALVE — Prevents blow until full line pressure is reached . . . operates on as little as 80 psi. Air gauge is standard equipment.

REMOVABLE TABLE CLAMP — For handling vertically-split core boxes . . . provides fast easy set up . . . lifts off when horizontally-split boxes are blown.

FULL TWO-INCH DRAW — For drawing horizontally-split boxes or one-piece boxes attached to the blower magazine (Model CB5CD.)

SINGLE PUSH-BUTTON CONTROL Fastest operation which completely eliminates error or possibility of error and insures minimum air consumption.

* **STAND OR BENCH** — An individual stand with work apron is available as optional equipment.

*The new low cost CB5C Flexiblo is the most flexible, easiest to operate *bench core blower ever introduced*

Now small jobbing foundry core rooms can have all of the advantages of push-button coreblowing at lowest cost with the new B &P Flexiblo. Push-button control eliminates errors and provides the fastest possible cycle. Minimum air consumption is insured, and a new improved blow valve provides harder, more uniform coreblowing.

Yet, with all of these real "production" features, full jobbing flexibility has been built in. Thus, Flexiblo handles all types of core box equipment and blows either wooden or metal boxes. With the new quick-change blow plate design of the magazine, blow plates may be changed in seconds. The new blow valve, with built-in exhaust, actually agitates the sand in the blower magazine and permits use of a much wider range of core sands.

For full information and prices write directly to *BEARDSLEY & PIPER, Division Pettibone Mulliken Corporation, 2424 North Cicero Avenue, Chicago 39, Illinois.*

LOOK TO
BEARDSLEY & PIPER
FOR BETTER METHODS

MEMBER FEMA

Bishop, Naval Research Laboratory, the Joseph S. Seaman Medal.

Honorary life memberships will go to: Joseph C. Pendleton, former superintendent of the foundry division, Newport News Shipbuilding & Dry Dock Co.; William D. McMillan, McCormick Works, International Harvester Co., and Bruce L. Simpson as retiring president of the society.

FOUNDRY Index Is Ready

Index to FOUNDRY, Volume 83, listing by title, subject matter and author the editorial material published during 1955, is ready.

Readers find the index a ready reference to various phases of foundry practice, new techniques and recent developments in the industry and a quick means of locating information published during the year.

Subscribers may obtain copies without charge by directing requests to FOUNDRY, Penton Building, Cleveland 13, O.

GE Plans Foundry Laboratory

A $750,000 applied research and development laboratory to improve foundry processes and products is to be established in Schenectady, N. Y., by General Electric Co. Dr. Jack Keverian has been appointed manager of the operation.

The new laboratory will have a development foundry and areas for physical and chemical testing, metallography, radiography and ceramics. Seventeen engineers and technicians will comprise the laboratory staff, which will serve foundry operations at Everett and Lynn, Mass., Elmira, N. Y., and Erie, Pa., as well as in Schenectady. The laboratory will occupy 22,000 sq ft of space in building 93 of the Schenectady General Electric Co. Works.

USING TOO MUCH COKE?

Why not talk this over with one of our metallurgists with a view to taking advantage of the superior quality of Semet-Solvay Foundry Coke in reducing your melting costs.

SEMET-SOLVAY DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street — New York 6, N. Y.
Buffalo • Cincinnati — Cleveland • Detroit
In Canada: SEMET-SOLVAY COMPANY, LTD., Toronto
Western Agent: WILSON & GEO. MEYER & CO., San Francisco

For Better Melting

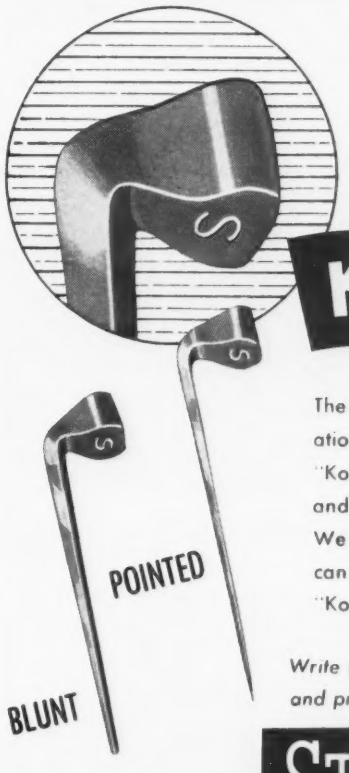


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Fig. 1—Partial view of magnesium foundry shows arrangement of tilting metal furnaces, the tilting holding furnaces and some permanent molds

Volkswagen Is Large User of

MAGNESIUM ALLOY CASTINGS

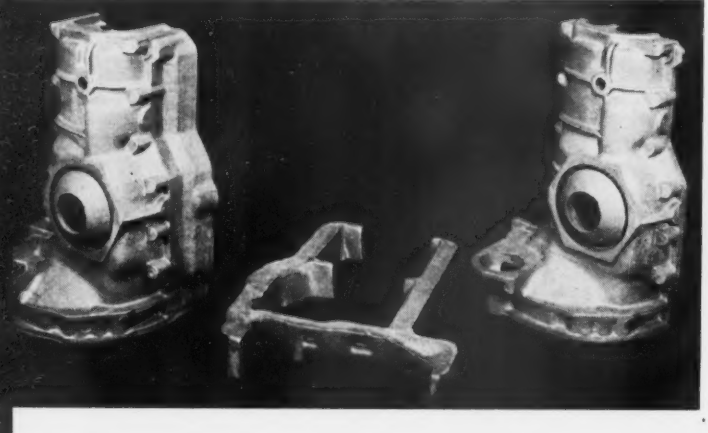
By LUDWIG C. BOEHNER
Chief Engineer
Volkswagenwerk
Wolfsburg, Germany

INCREASING popularity of the German Volkswagen automobile in America has made it a familiar sight in many sections of the country. Foundrymen will be interested to learn that the car makes extensive use of magnesium castings for such parts as engine crankcase, rear axle, transmission housing and miscellaneous parts. To a great degree, these castings are the key to the success of the car, for the Volkswagen is rear-engined.

In any car with the engine in the rear, the designer's problem is to achieve good weight distribution which is vital to behavior of the car on the road. Finished magnesium castings in the Volkswagen total 36 lb, or 110 less than they would weigh if they were cast in iron, and all are in the rear. Weight distribution between front and rear is in the ratio of 45 to 55 with two passengers in

Editor's note: This article is condensed from a paper presented by the author before the eleventh annual convention of the Magnesium Association in New York, Oct. 31-Nov. 1.

Figs. 2 and 3—*Left,* transmission housing cast in permanent mold. *Right,* same part made as a die casting. In both, as-cast part is on left and trimmed part on right



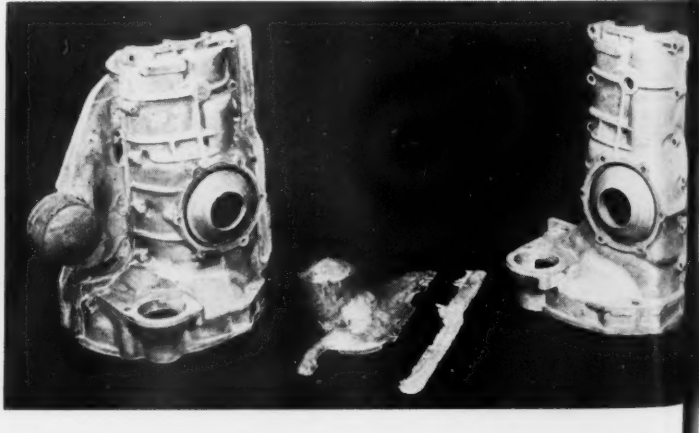
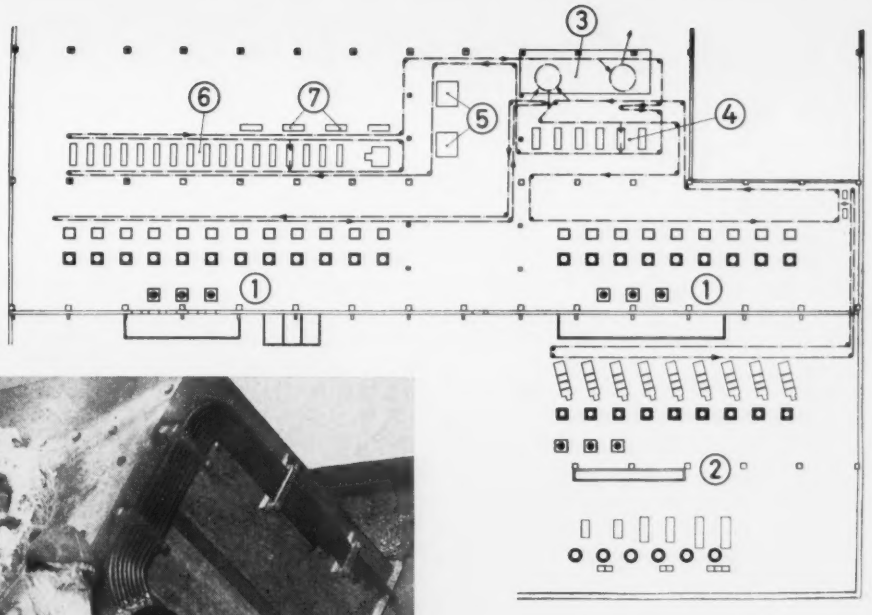


Fig. 4—Diagram shows layout of permanent mold and die casting magnesium foundry, and numbers locate following departments: 1. Permanent mold foundry. 2. Die casting foundry. 3. Pickling plant. 4. First inspection. 5. Saws. 6. Trimming plant. 7. The final inspection



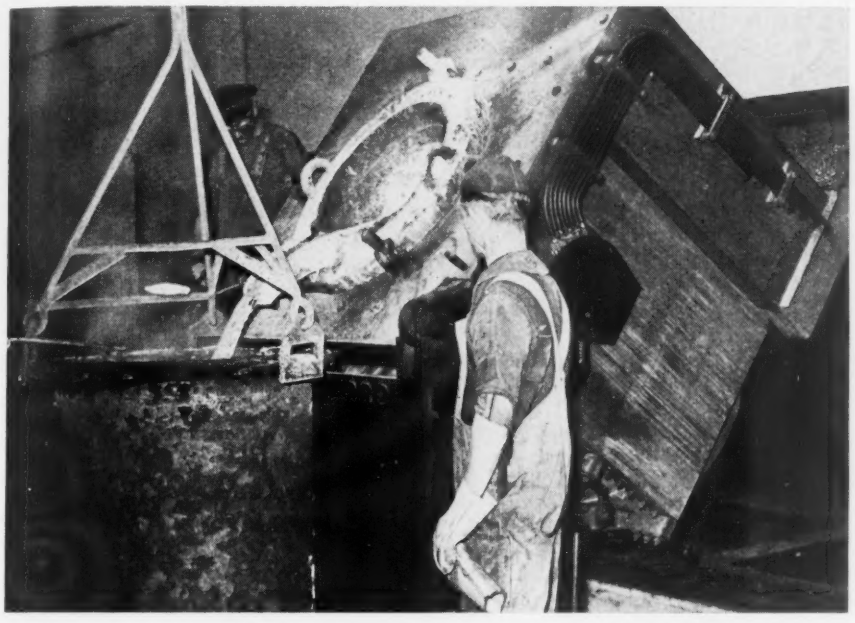


Fig. 5 (left)—Pouring from a magnesium melting furnace. In Fig. 1, on previous page, view of part of foundry shows three of these units at upper right

the front and 42 to 58 with four passengers and luggage. Volkswagen engineers feel that this ratio must not be exceeded if satisfactory control of the car is to be maintained.

Engine, clutch and transmission housing weigh 270 lb, and the engine alone weighs 170 lb. The 36-hp engine will carry four or five passengers and luggage—a payload of 850 lb—at a top speed of 70 mph. It is air cooled, with opposed pistons, and the wheels are independently sprung. Of course, application of a light metal does not in itself assure a satisfactory rear-engined automobile. Size and weight of the remaining components of the power plant and the drive unit must be tailored to the car to give satisfactory over-all performance.

Fig. 6 shows the split crankcase halves. Combined weight of these halves when machined is only 20½ lb, principally because wall thicknesses and sections are no heavier than would be necessary in an equivalent gray iron casting. The crankshaft runs on four main bearings made of aluminum tubing. Only the No. 2 bearing from the front is split; the rest are circular, one-piece bearings. The camshaft runs directly into the crankcase bore, and no bushings are used. This construction never has offered any difficulties and demonstrates that magnesium has excellent bearing qualities. If reboring is necessary for any reason, the faces of the two halves are machined off about 0.010-in. and the assembly with the original bearing diameters is rebored.

A great number of threaded studs is used in the crankcase design, all of which—a total of 25—are screwed in mechanically in one operation;

Fig. 6—Left and right halves of crankcase. Combined weight of the machined halves totals 20.5 lb

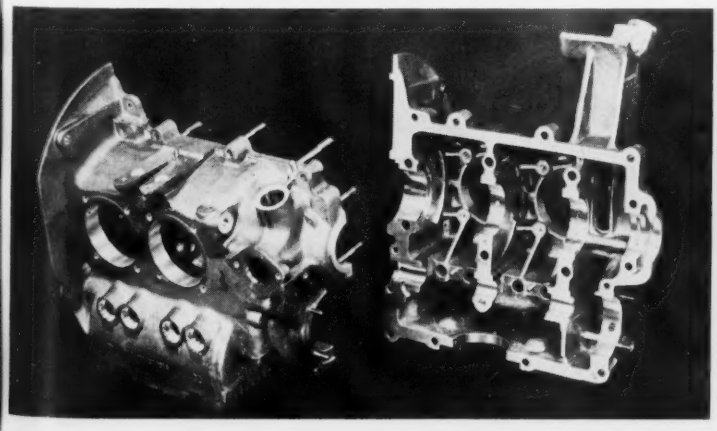
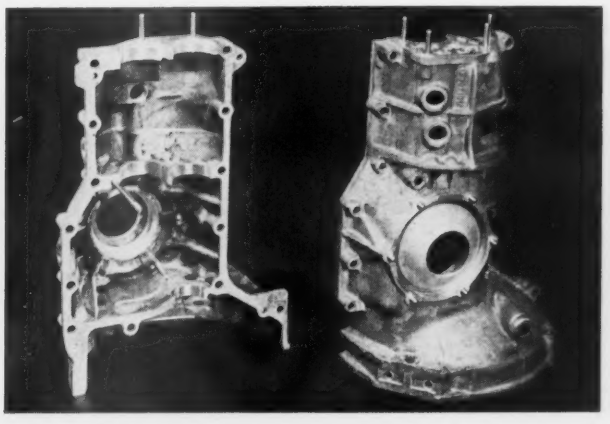


Fig. 7—Machined left and right halves of the transmission housing. Their combined weight is 13.5 lb



Dear Reader:

Note these feature articles scheduled for future issues of FOUNDRY --- if you are one of our many "pass-along copy" readers, now is a good time to invest $5 in a one-year personal subscription!

THE CO_2 PROCESS

Another good article on factors involved in this new method of core and mold hardening. Prepared by John Gotheridge and Frank Dursall of Foundry Services Inc., this article offers a number of definite recommendations, based on actual foundry practice, for successful use of the process.

GATING

This subject always is important to foundrymen. It will be treated in two separate articles. One, by Hubert Chappie, National Supply Co., Torrance, Calif., will suggest means for proper gating of steel castings so as to produce quality products free from sand inclusions. Another article will detail examples of skillful gating of several bronze castings at the Somerville Machine & Foundry Co., Somerville, Mass.

BRASS FOUNDRY ALLOYS

The next article in Harry St. John's series on brass foundry practice will discuss the various types of copper-base alloys. Properties of each and their applications will be described.

SAND RECLAMATION

Description of the principle of a dry sand reclamation system, equipment involved, typical layouts and an analysis of possible savings. These are included in a coming article by Henry W. Zimnawoda, National Engineering Co.

OTHER ARTICLES "IN THE WORKS" --- Automatic Casting in Permanent Molds --- Hints for the Patternmaker --- Rapid Sorting of Contaminated Castings --- Dolomite as a Flux in Basic Steelmaking.

***** We have copies of our 32-page "Glossary of Foundry Terms" and the widely-read booklet "How To Use the Cupola" presently available for complimentary distribution to the first fifty readers who write for copies! Address your request to Jeanne Franklin, FOUNDRY, Penton Bldg., Cleveland 13.

FOUNDRY

this job shows the excellent machining qualities of magnesium and the ease of assembly it makes possible.

The transmission housing, Fig. 7, also is of split design and weighs 13½ lb without studs. It contains the gears and shafts of a four-speed, syncromesh transmission as well as a complete differential, ring gear and pinion with swinging half axles. The assembly is bolted directly to the engine. Other magnesium castings include the transmission support bracket, 1.4 lb; steering gear cover, 0.19 lb; oil pump housing, 0.24 lb; and the camshaft timing gear, 0.53 lb.

All magnesium castings are produced in the company's foundry by about 500 men in three shifts. A partial view of the magnesium foundry is shown in Fig. 1, and Fig. 4 illustrates the layout of the entire plant, which covers 65,000 sq ft. The partial view shows the arrangement of the tilting melting furnaces, the tilting holding furnaces and a number of permanent molds.

Melting Units Are Induction Heated

All melting furnaces are made of steel and are induction heated. This design gives such freedom from scale that more than 600 tons of metal can be melted before relining is necessary. Nine melting furnaces of the type shown are used. Each holds about 1300 lb of metal, and melting time is about 40 minutes. In addition, there are 36 holding furnaces with capacities ranging from 400 to 1000 lb.

The alloy used for all magnesium castings is similar to SAE composition 501A. It contains 7.8-8 per cent Al, 0.1-0.8 per cent Zn, 0.1-0.5 per cent Mn, 0.3 maximum per cent Si, 0.2 maximum per cent Cu and 0.0005-0.0025 Be, with the balance Mg. The beryllium prevents oxidation. Physical properties vary according to whether a part is cast in permanent molds or is die cast. In permanent mold castings, yield strength is 14,000-18,500 psi; tensile strength is 20,000-21,500 psi; elongation in 2½ in. is 3.25 per cent; and brinell hardness (500 kg, 10 mm) is 54-56. By comparison, die castings have yield strength of 17,000-20,000 psi, tensile strength of 21,500-24,000 psi, elongation of 2 per cent and Bhn of 60-64.

All engine crankcase halves are cast in permanent molds, which produce a smooth casting practically free of porosity. About 120,000 castings are made from a mold before reworking is necessary. A disadvantage of the process is the great amount of waste metal in the form of deadheads, feeders, etc., which must be trimmed off. It amounts to about 70 per cent of the final weight. The company consequently is converting to the pressure die casting method, and most transmission housings and small parts already are die cast. About 1500 complete transmission housings and engine crankcases are produced per day.

Volkswagen uses cold chamber die casting machines, which it feels are preferable for its large and intricate castings. Each machine produces about 18 transmission halves per hour. Castings are loaded onto a conveyor which passes through tanks of boiling water to preheat pieces and continues through the pickling tanks. Castings then are rinsed and heated again to dry them and for inspection for cracks and other imperfections. Feeders are trimmed off on large, circular trim saws which permit continuous loading and unloading. Next, they go through the finishing trim line, where all burrs are removed. After a final inspec-

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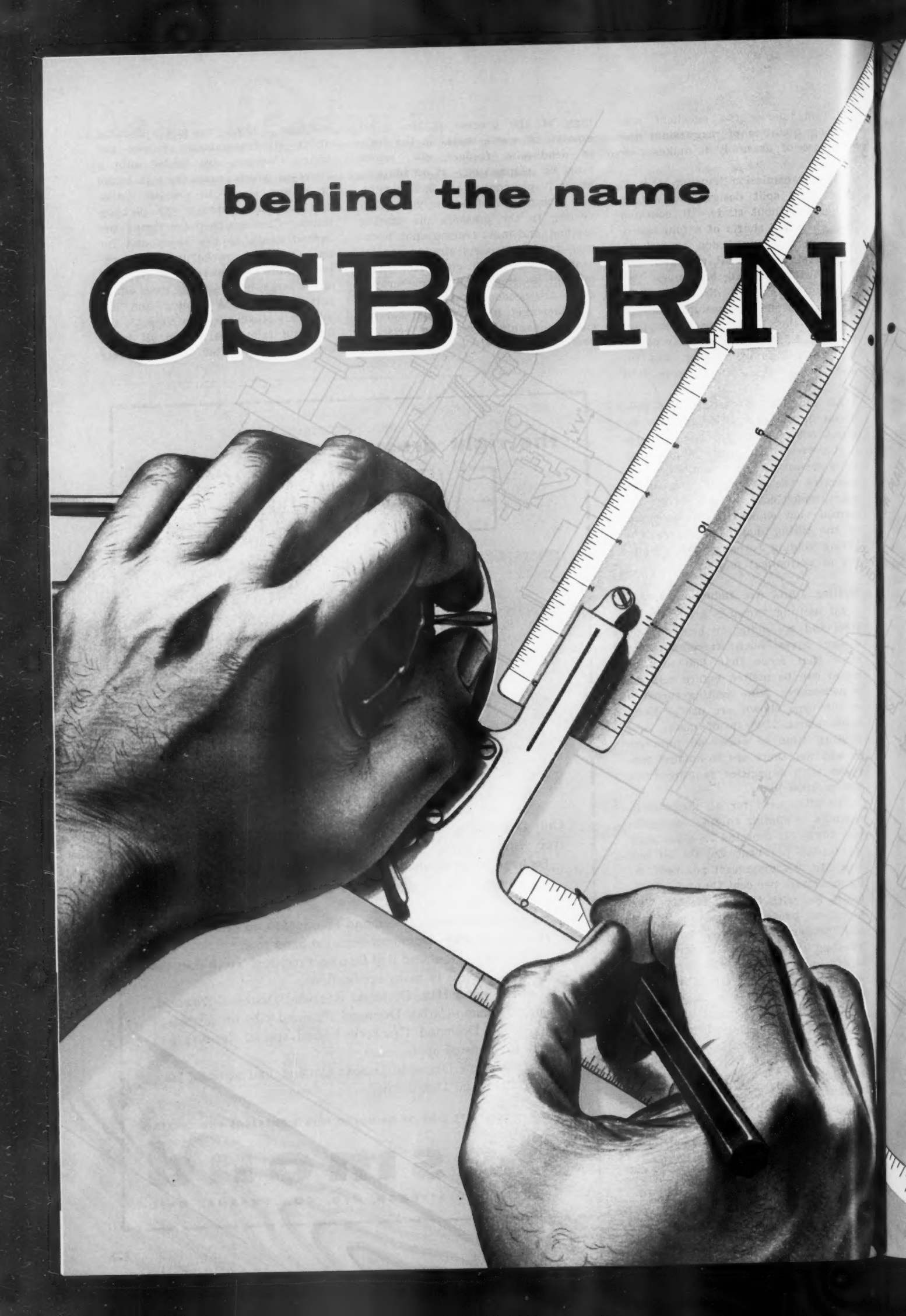
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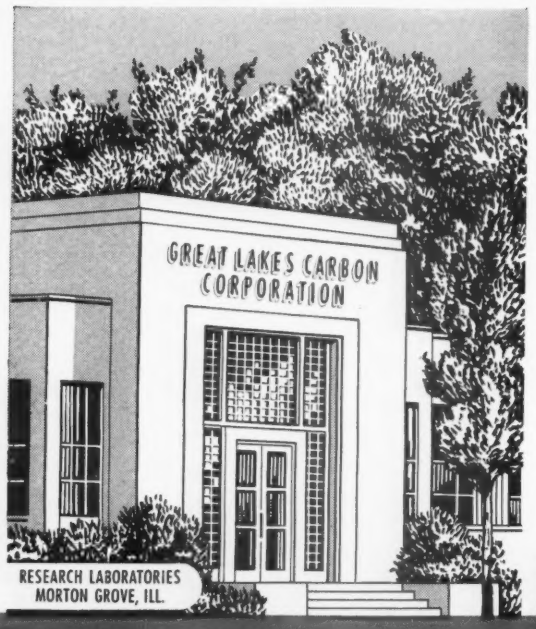

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tion, they again are pickled and are shipped to the machine shop.

Machining is done on special equipment particularly designed for the company's purposes. Most is of the rotating table or drum type, and each casting is loaded individually. To date, these parts purposely have not been machined on transfer machines because the low modulus of elasticity permits harmful distortion, which must be avoided. Magnesium castings require a different approach where automation is involved, but the firm thinks it is approaching a solution to the problem.

Its low modulus of elasticity, high coefficient of thermal expansion and the inflammability of magnesium have been the chief objections to use of the metal. The first two disadvantages have been overcome through a combination of measures, and the third has never bothered the company. Volkswagen has never had a fire of any consequence—largely, of course, because it has taken steps to prevent such an occurrence. Production in 1955 is estimated at 330,000 vehicles.

Industrial Research Conference Will Be Held in Chicago

The motives, management and results of industrial research will be examined at the first annual National Industrial Research Conference, Apr. 18-19, Hotel Sherman, Chicago. Sponsor is Armour Research Foundation of Illinois Institute of Technology.

Purpose of the conference is to provide a forum where common problems of industrial research can be discussed at management level. Twelve papers will be presented at three half-day sessions, two luncheon meetings and a dinner meeting.

The opening session will deal with the record of profitable research and will include addresses by representatives of large and medium-sized firms and a trade association. Research management discussions will be covered in the second session, with papers on the value of basic research. use of outside research facilities and a view of results. The final session will relate to how the typical stockholder, company and researcher regards research.

Further information can be obtained from Joseph J. Kowal, conference secretary, Armour Research Foundation of Illinois Institute of Technology, 10 West 35th St., Chicago 16.

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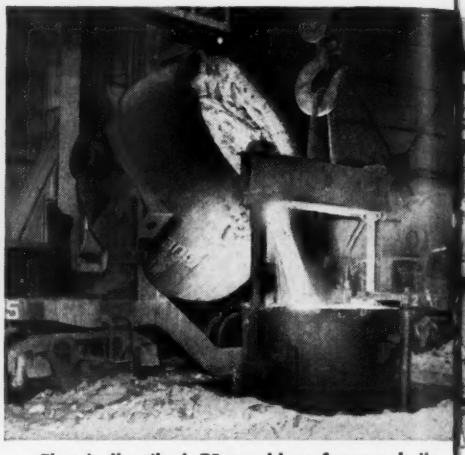
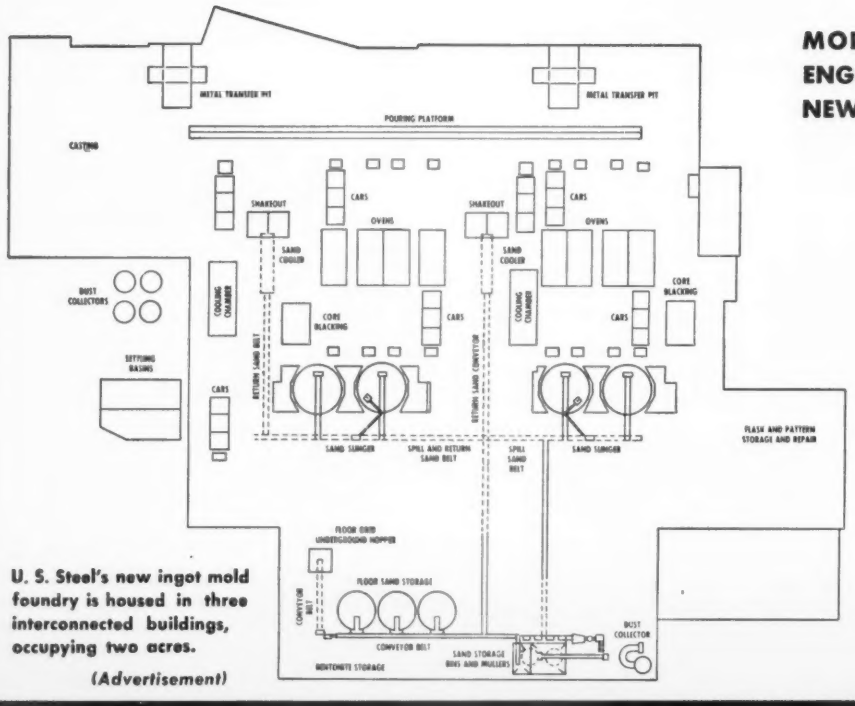
Molds and cores are made on four turntables, each 25 ft. in diameter. U. S. Steel engineers worked closely with Giffels & Vallet in developing these tables and other special equipment for the new foundry.

Five stages of ingot mold core production are shown in this view. Molder perched on sand-slinger rams the cores in rotation.



Electrically tilted 75-ton blast furnace ladle pours molten cast iron into 20-ton bottom-pour ladles.

How U.S. Steel Increased Ingot Mold Production to 1,055 Tons per Day!



U. S. Steel's new ingot mold foundry is housed in three interconnected buildings, occupying two acres.

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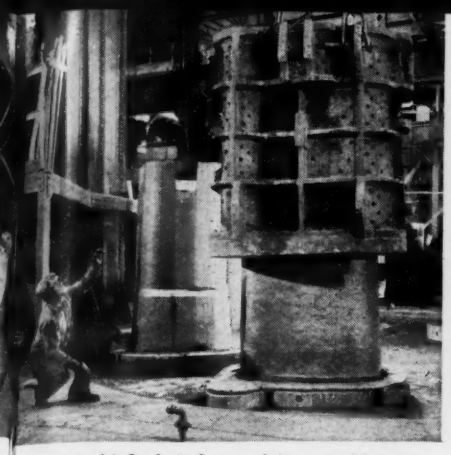
MODERN MECHANIZED FOUNDRY FACILITIES ENGINEERED BY GIFFELS & VALLET, INC. PROVIDE NEW EFFICIENCY, BETTER WORKING CONDITIONS

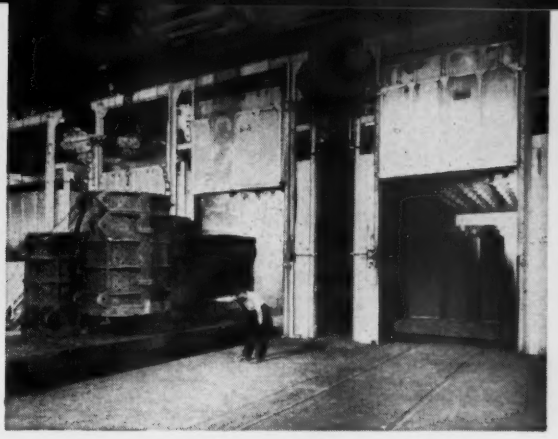
United States Steel's new ingot mold foundry at their Edgar Thompson Works in Braddock, Pa. is perhaps the largest and most modern facility of its kind in the steel industry today! Capable of producing 275,000 tons of ingot molds annually, it answers the company's need for greater production at lower cost, and provides safe, healthy working conditions for personnel.

This installation, with its many new methods and facilities, was developed through the close teamwork of U. S. Steel engineers and Giffels & Vallet, Inc. As the project progressed from initial surveys and basic planning to a finished operating foundry, the extensive facilities of both organizations were coordinated on all phases of design, engineering, specification and construction. G&V's extensive background of foundry experience was drawn upon repeatedly to take full advantage of the most effective methods and designs.

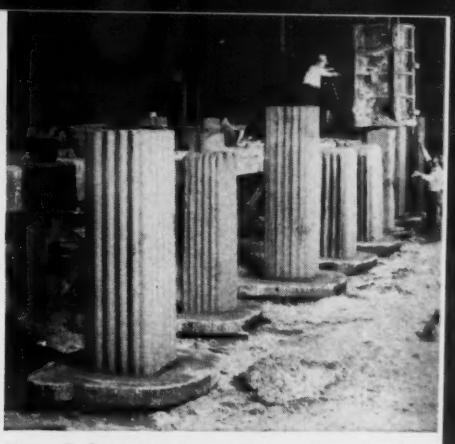
To accomplish the production-requirement goals set up by U. S. Steel, mechanization was employed wherever possible and practical. Special conveyor systems, bulk-handling ele-



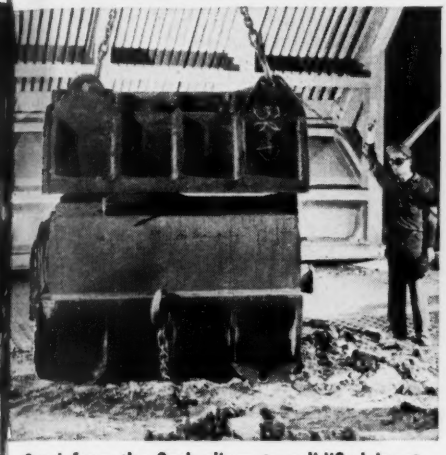
Ingot mold flask is lowered into position on turntable before automatic sandslinger rams molding sand into place.



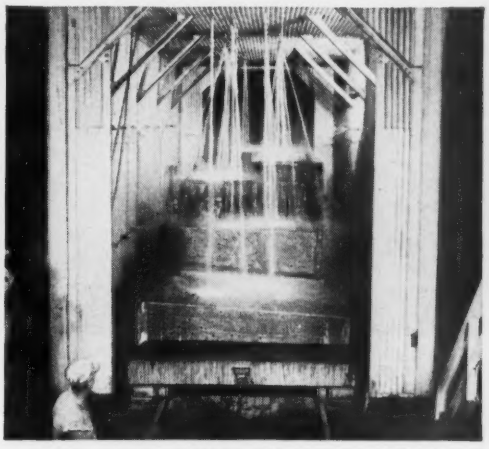
Four automatically controlled ovens dry sand molds and cores preparatory to casting of ingot molds.



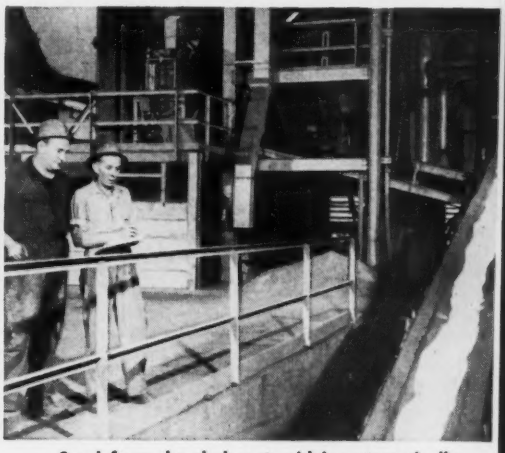
One of three pouring stations where ingot mold interiors are formed by modern methods and facilities.



Sand from the flask clings to solidified ingot mold as sections of the flask are removed.



Water spray quickly cools barrels and flask rigs as they move through cooling chamber on cars.



Sand from the shakeout grid is automatically returned to 200-ton storage bin on this inclined conveyor belt.

vators and other material handling equipment were designed to meet specific problems. Both equipment and buildings were planned to provide the utmost in safety and pleasant, healthy working conditions.

Material handled and processed by automatic systems

The foundry is housed in three interconnected buildings: the sand preparation department, the ramming-molding and drying ovens departments, and the casting department. Washed and dried silica sand is brought into the sand preparation building, unloaded into a hopper below floor level and emptied onto a second conveyor belt. The belt moves sand across the building and drops it through chutes into either of two elevated 50-ton storage bins.

Bentonite bond is emptied five bags at a time into a pneumatic handling system and distributed to five 10-ton hoppers. Used sand from the shakeout is returned on a conveyor belt to the sand preparation department. Sands, bentonite and water are fed automatically into two 2,200 lb. capacity sand mullers by means of a control panel which also controls the mixing cycle. Sand is then automatically discharged onto a 70 ft. conveyor belt which empties it into a 20-ton sandslinger near the ramming and oven departments. At all points in the building where there is any possibility of a dust problem, a powerful exhaust system carries the air to a dust collector

Ramming-molding operations and the drying ovens are housed in a 127 x 286 ft. building. The ramming-molding department contains two complete molding sections running parallel to each other. Each is comprised of a motive-type sandslinger, two turntables 25 ft. in diameter, four drying ovens, a shakeout unit, and a flask and barrel cooling chamber.

Four giant turntables serve ramming-molding department

Turntables are of massive construction and are rotated by electrically driven pinions. The tables are partially surrounded by an elevated platform from which operators set spouts, finish tops of molds and cores, etc. Cores are usually made on one turntable, and molds on the other, however, both can be made on one table. Spill sand from the ramming operation is swept into an open grid in the center of the turntable, where it falls into a hopper and is returned to the sand preparation building.

Completed sand molds and cores are picked up by three 35-ton cranes and loaded on cars which carry them into gas-fired recirculating-type drying ovens. Molds and cores dry 4 to 6 hours, depending on size, and then are pulled into the casting department and unloaded from the cars. Recording-type instruments control cycle and temperature of the ovens.

The 100 x 360 ft. casting department is served by three 75-ton cranes, and three 25-ton auxiliary hoists. Molten cast iron is brought from a blast furnace nearby in special 75-ton oval-shaped ladles with electrically-operated tilting mechanisms. Molds are filled from 20-ton bottom-pour ladles. After the metal has solidified, molds are placed on the shakeout grid by cranes, disassembled, and the flasks and core barrels are moved on cars into a cooling chamber. Numerous water jets in the top of the chamber rapidly reduce the temperature of flasks and core barrels, thus permitting easier handling and more rapid turn-around.

Coordinated dust control and ventilation systems provide clean air

An exhaust hood at the back of the shakeout grid exhausts dust-laden air from above and below the grid at the rate of 66,000 cfm. Four wet-type dust collectors located outside the building remove dust from the air with water sprays. Sand removed from castings on the shakeout grid drops into hoppers and is transferred to an inclined rotary sand cooler where it is cooled by water sprays.

In addition to dust-collection hoods at critical points, adequate ventilation to insure comfortable working conditions is provided by five propeller-type exhaust fans mounted in the roof of each building. The combined ventilation systems can change the air in the building 14 times an hour. Numerous steam-type unit heaters are located to cover overlapping areas. The heating system can supply a total of 2,000,000 BTU per hour.

For more than thirty years G&V's comprehensive planning-engineering services have pointed the way to greater output, lower costs and improved casting quality for foundries across the nation. This flexible service can be used to plan, engineer and supervise an entire project, or to supplement the facilities of your own engineering department.

Whether it's a complete new plant, or the modernization of present facilities, G&V services will meet your requirements for low-cost, high-output production. These services are discussed in a special Foundry Brochure. A copy will be mailed on request.

INDUSTRIAL ENGINEERING DIVISION

Giffels & Vallet INC.

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Engineers Serving Industry for Over 30 Years

(Advertisemen

Fig. 1—Numbered yard vehicles are driven only by trained men

Fig. 2—Whenever possible, materials are palletized to facilitate their handling by fork lift truck. Illustration shows efficient use of space

Control System Cuts Costs in

INDUSTRIAL TRUCK OPERATION

By FRANCIS A. WESTBROOK

INTRAPLANT transportation is a real problem at Electric Steel Foundry Co., Portland, Oreg. The plant covers 12 acres, through which traffic moves in complex patterns. Proper handling of that traffic is vital to efficient production, and Bert Mansfield, truck operation supervisor, has developed a control system which speeds up handling, saves 8 manhours per day in the maintenance department and reduces accidents.

In this plant as in many other large ones, mobile handling equipment is important because of the big tonnage of diversified castings, sand and other bulk materials which must be transported relatively long distances.

Castings include such items as power-shovel dippers, drag buckets and teeth, bulldozer rooters and blade cutting edges, drag line buckets and hoe dippers for the construction industry; corrosion-resistant stainless castings and heat-resistant high alloy steel castings for the chemical and processing industries; and cast rigging and mill equipment for the logging industry. In addition, many special castings are made on order. About 7 tons of raw materials and sand are handled for each ton of finished castings. Total amount of sand used per month is over 6000 tons.

Motorized mobile material handling equipment consists of seven fork lift trucks of various capacities, one yard crane, one front-end loader, three tractors and three pickup trucks.

Wherever possible all materials are palletized to facilitate handling by the fork lift trucks, as pictured in Fig. 2. Fork lift trucks also are used with special scoops (Fig. 3) and dump buckets (Fig. 5) for handling sand. In fact, the fork lift trucks are extremely useful for many purposes. That's why seven of them are in service. The mobile crane handles

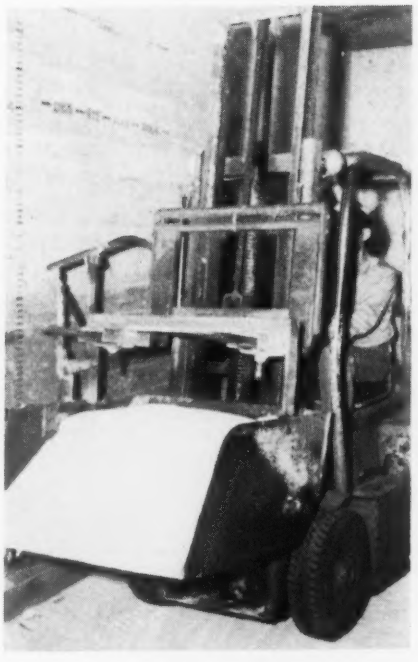
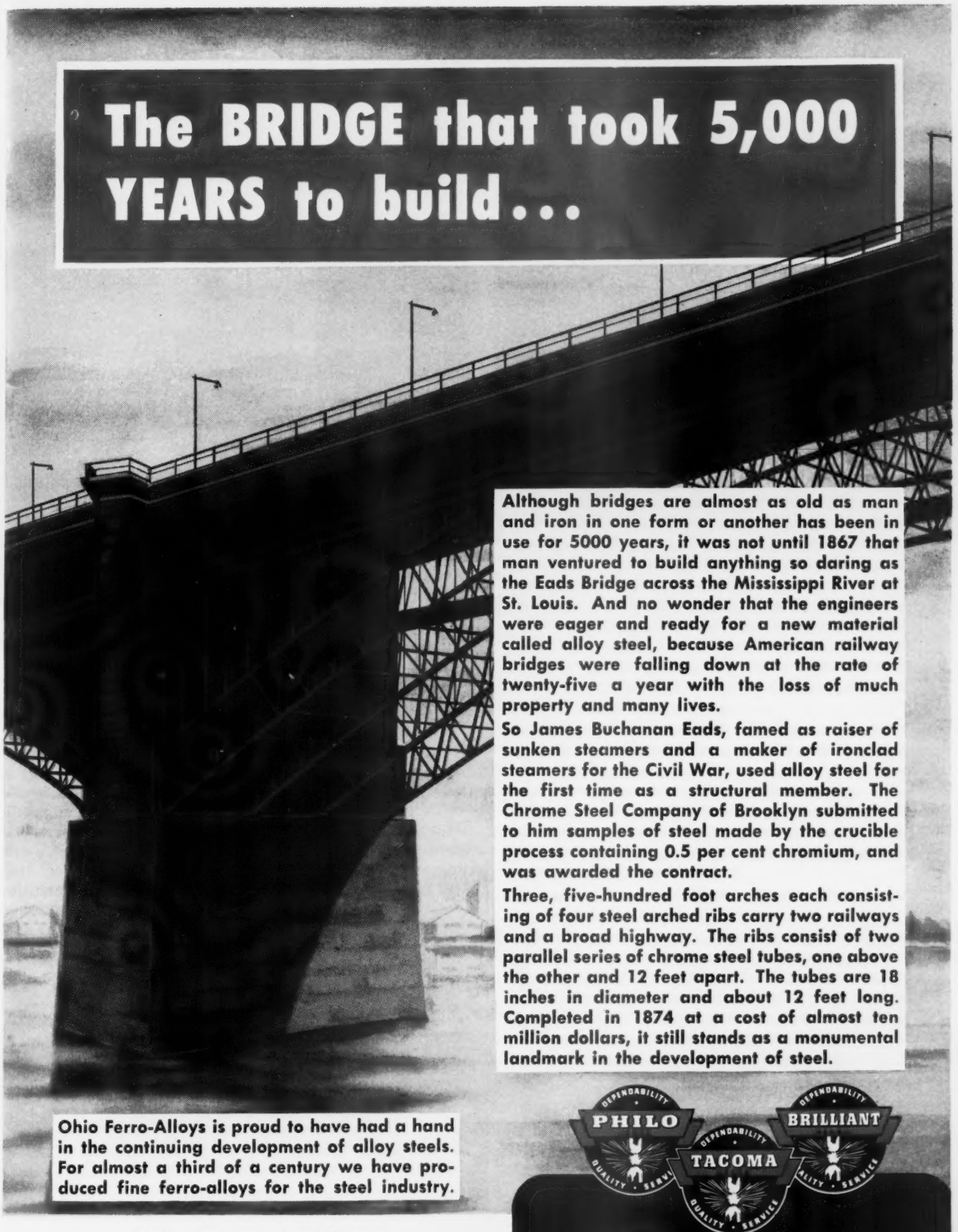


Fig. 3—Scoop attachment on a fork truck aids sand handling

The BRIDGE that took 5,000 YEARS to build...



Although bridges are almost as old as man and iron in one form or another has been in use for 5000 years, it was not until 1867 that man ventured to build anything so daring as the Eads Bridge across the Mississippi River at St. Louis. And no wonder that the engineers were eager and ready for a new material called alloy steel, because American railway bridges were falling down at the rate of twenty-five a year with the loss of much property and many lives.

So James Buchanan Eads, famed as raiser of sunken steamers and a maker of ironclad steamers for the Civil War, used alloy steel for the first time as a structural member. The Chrome Steel Company of Brooklyn submitted to him samples of steel made by the crucible process containing 0.5 per cent chromium, and was awarded the contract.

Three, five-hundred foot arches each consisting of four steel arched ribs carry two railways and a broad highway. The ribs consist of two parallel series of chrome steel tubes, one above the other and 12 feet apart. The tubes are 18 inches in diameter and about 12 feet long. Completed in 1874 at a cost of almost ten million dollars, it still stands as a monumental landmark in the development of steel.

Ohio Ferro-Alloys is proud to have had a hand in the continuing development of alloy steels. For almost a third of a century we have produced fine ferro-alloys for the steel industry.

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Ohio Ferro-Alloys Corporation

Canton, Ohio

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Fig. 4—Mobile crane moves materials when shape or size renders fork lift truck handling impractical

Fig. 5—Dump bucket is another fork lift truck attachment which does a good job with bulk materials

materials of sizes and shapes which make it impractical to transport them by fork trucks (Fig. 4), and the front-end loader is employed to load used sand, slag and waste materials onto highway trucks which take them to the dump (Fig. 6). Patterns and coreboxes are transported by tractor (Fig. 7).

All yard vehicles are numbered (Fig. 1) and are driven only by trained men who have passed qualifying tests. Such operators are given local drivers' licenses in the form of plastic badges which they wear conspicuously displayed while on duty. The number on the badge refers to the operator, and its color indicates the type of unit he is allowed to drive.

The idea back of this system is that when only specific persons are assigned to a machine and given the responsibility for its proper operation, it will receive better care than it would if assignments were made haphazardly, to men without special training. Before this system was put into effect, over 120 men had been operating the equipment; this number now has been reduced to 70.

An "Inspection Report" card is given to each licensed driver at the beginning of each shift, and readings from an engine-hour meter are entered on the card by the driver at the start and finish of his shift. He also makes other entries, regarding the machine he is driving. At the end of his shift, the driver turns in his card to the truck operation supervisor, who obtains from it data concerning hours of operation, repairs and adjustments needed, etc. This method furnishes useful, easily observed data regarding each vehicle and facilitates efficient control of its operation.

Records also are kept in the maintenance shop to cover all servicing and repairs. They are important to the preventive maintenance program, which saves much lost time by avoiding some of the breakdowns which otherwise would interfere with production schedules.

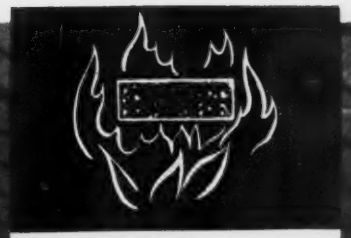
Information from the maintenance records regarding each vehicle also is entered on the supervisor's master sheet and enables the supervisor to control operation of the various units to the best advantage. For instance, it may indicate that some units are not working at full capacity and that the work being done by two can be handled by one, so that the other may be taken out of service temporarily or used elsewhere. Conversely, the master sheet might show that a unit is being called upon to do more than it can accomplish efficiently and that another, with a less heavy schedule, should be assigned to relieve the situ-

Fig. 6—Front-end loader is used to load refuse on highway trucks which then transport it to the dump

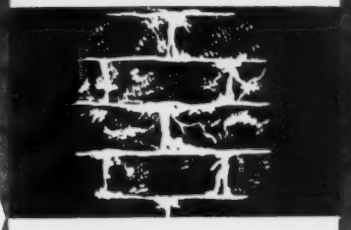
Fig. 7—Patterns, coreboxes and other items of a similar nature are carried by one of the tractors

Profitable trends in the use of refractories

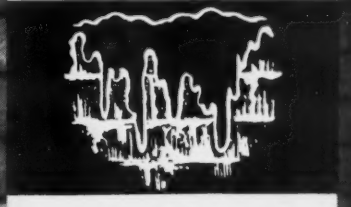
Laclede's 5-Step Approach results in sound, economical refractory selection



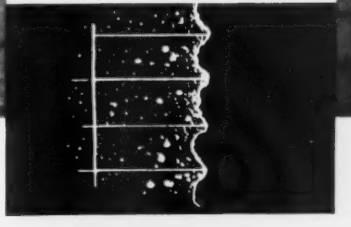
1. Degree of Temperature



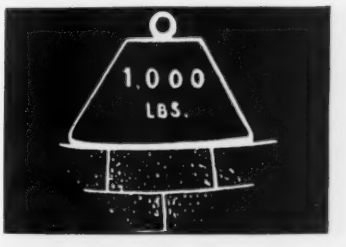
2. Spalling



3. Slag Action



4. Abrasion



5. Load

The type of refractory most economical for your job is generally determined by five factors: (1) Degree of temperature, (2) Spalling, (3) Slag action, (4) Abrasion, and (5) Load.

A periodic review of these factors frequently results in savings both in time and money. You may find that Laclede-Christy offers a particular type of refractory that substantially increases service life. Or you may find your heating conditions have changed—suggesting a change in refractories. Or you may have a special problem which Laclede's 5-Step Approach will help you solve.

Laclede offers many types and grades of refractories you may need. Assistance in the selection of the best and most economical type for your purpose is part of Laclede's specialized service.

Make profitable use of this service. Call your nearby Laclede representative.

Write for Laclede's Refractory Selection Guide.

LACLEDE-CHRISTY COMPANY DIVISION

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Is your present abrasive tough enough to prove itself in performance? You can't judge an abrasive by looks, claims or promises. The only test of any abrasive is its *cost per ton of castings cleaned.* Because of exclusive metallurgical characteristics, Malleabrasive gives you the lowest cost per ton cleaned of any premium abrasive on the market! This has been proved in hundreds of production tests by users throughout the country. Prove it in your own production test—put muscle behind *your* blast cleaning with Malleabrasive! *We GUARANTEE that Malleabrasive will give you lowest cost per ton of castings cleaned.*

NOW — IN EASY TO HANDLE 50 POUND DOUBLE BURLAP BAGS

To order Malleabrasive, or for additional information on running a test, contact Globe Steel Abrasive Co., Mansfield, Ohio.

Sold and recommended by Pangborn Corporation, Hagerstown, Md.

MALLEABRASIVE

ation. The master sheet also shows whether a truck is assigned to work too heavy for it. If maintenance seems unduly frequent or indicates that the vehicle is being overloaded, another of greater capacity, can be assigned to the job.

Finally, the truck control supervisor has an observation post, in a small extension jutting out from one of the centrally located buildings, from which he can observe what is going on. This arrangement enables him to make changes in the operation of the trucks from time to time, as conditions make them advisable.

Association Issues 1955 Index To Industrial Gas Equipment

The 1955 edition of "A List of Gas Equipment for Industrial Uses" has been issued by the Industrial Gas Equipment Division of the Gas Appliances Manufacturers Association. The fourth edition, it is divided into three sections: 1. Names, addresses and products of manufacturers of such equipment. 2. Alphabetical list of gas equipment and accessories with names of manufacturers of each. 3. Trade names under which products are sold and manufacturers.

All equipment makers listed in the booklet have subscribed to the "Code of Ethics" prepared by the Industrial Division as a customer's guide to design and performance of such equipment. Copies of the volume may be obtained for $1 each from the Gas Appliance Manufacturers Association, 60 East 42nd St., New York 17.

Book Review

Der Hartguss (White or Chilled Iron Castings), by Richard Meyer, cloth, 331 pages, 6⅞ x 9½ in., published by Veb Wilhelm Knapp Verlag, Halle (Saale), Germany. Price 23.20 DM.

This German book written for the practical man and student deals with the manufacture of white or chilled iron castings. The book is divided into two sections. The first discusses such topics as scientific principles, metallurgy, chill depth and measurement, chemical composition, hardness and testing, influence of elements, patents on duplex chilled castings (rolls), and classification of rolls.

The second section pertains to production of rolls and other chilled iron castings. It considers such phases as raw materials, plant control methods, melting units, and molding and other foundry techniques. Remainder of the book occupying over 125 pages, is devoted to details of chilled roll manufacture.

This Brand New AO† Goggle with Calobar Lenses for Furnace Tenders has Many Advances including *Ultrascopic Vision*!*

(Available with or without side shields)

F5100
with Side Shields
(Comfort Cable
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Tip Temples)

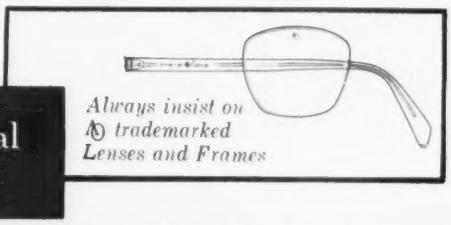
*Note how new ultrascopic lens shape provides extra coverage at outer circumference of lens

Here's a spectacle type goggle which provides cup goggle values. Why? Because the eyewire design assures truer lens retention — an AO engineering advance which affords maximum protection if lens is struck . . . because removable side shields permit a better fit. They're individually fitted, adjustable, replaceable. Your nearest AO Safety Products Representative can supply you.

Quick Facts

- Reversible endpieces on side shield model for compact folding of goggle
- Side Shields built for each size eye. Rx fitting is easy
- Temples: Spatula Tip available on non-side shield models, Comfort Cable standard on goggles with and without side shields
- Stronger, double-braced bridge
- 4 eye sizes — 5 bridge sizes
- Beaded engraving on eyewire — countersunk screw heads for security — non-corrosive nose pads
- Lenses: 6 Curve Super Armorplate Calobar; medium, dark, extra dark
- Many new features

†T.M. Reg. by American Optical Company



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SAFETY PRODUCTS DIVISION

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NOW-IN 50 POUND DOUBLE BURLAP BAGS

America's Foremost Line of Metal Abrasives

"...Here's the Abrasive Package I Like Best!"

"50-pound double burlap bags—they're for me! They're easy to pick up by the neck with one hand, or by the ends with two hands. Whichever way, once I have this bag in my hands, it *stays* there—nothing slippery about it like a slick-surfaced cardboard carton. Let one of those slick little boxes slip and fall on your foot and you'll know what I mean.

I can pick these little bags out of a tote box or shipping box, or off a pallet, one in each hand, because of that burlap neck. It takes two hands to fish one of those slippery little 50-pound cartons out of a tote or shipping box, or even to pick it up from a pallet.

And tossing these little 50-pound bags around has lugging 100-pound bags beat a mile! I can handle 40 of these little bags easier and quicker than I can handle 20 of the 100-pound bags. And tough!—say, these bags really take a beating—no breakage—no spilled abrasive to slide and slip around on—to sweep up. No waste. This 50-pound bag just *has everything!*"

50 pounds in each hand — handled easier than 100 pounds with 2 hands. No back sprains — no grievances from workers. 50-pound bags easier to stack.

Bags do not slip to fall and injure feet, or break to spill contents.

Empty bags can be neatly bundled and sold. No litter or disposal problems

As the oldest and largest manufacturers of metal abrasives in the world, over 60 years experience in packing and shipping hundreds of thousands of tons, have proven to us after trying every known method, that *nothing equals high quality double burlap bags for containing metal abrasives.*

Now, in changing from 100 pounds to only 50 pounds—in the same weight and quality of burlap formerly used for 100 pounds —we offer you America's *best abrasives* in America's *best abrasive package*—at no extra cost!

Here's the lightweight, easy to handle metal abrasive package that your receiving department, stock room and cleaning room employees will really go for. Here's the package that will shorten your unloading and storage time—cut overtime costs—get those late-arrival delivery trucks away from congested docks. This lighter package solves all those labor problems of metal abrasive handling in your plant, too.

This is the *one*—and *only* one—metal abrasive package that can be dropped and tossed repeatedly without breakage—without loss and waste of contents. Needs no extra protection of shipping box or pallet in transit, yet palletizes better than any other package—100 pound bags or 50 pound cartons—because these little bags pack more solidly, "tie-in" better, don't slip.

PITTSBURGH CRUSHED STEEL CO.

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Sales service to help you determine the type of metal abrasive most efficient and economical for your needs available from most principal points. Write us.

THE FINEST CONTAINER EVER DEVISED FOR METAL ABRASIVES—the 50-pound double burlap bag (one bag within another). "Gives"—absorbs repeated shock without breaking. Heavy paper "band-label" pasted and sewn to outer bag gives added strength and prevents sifting.

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OVENS for every baking requirement

OVENS that will be faster and less expensive to operate

OVENS that are designed to best fit your operation

Carl Mayer designs and manufactures all types of ovens as well as "specials" to meet unusual operating conditions. Most incorporate the Carl Mayer recirculating heating system with sealed combustion chamber that keeps gases from prematurely escaping into the load area. Cores and molds are baked evenly with no burning. Temperatures are always under control.

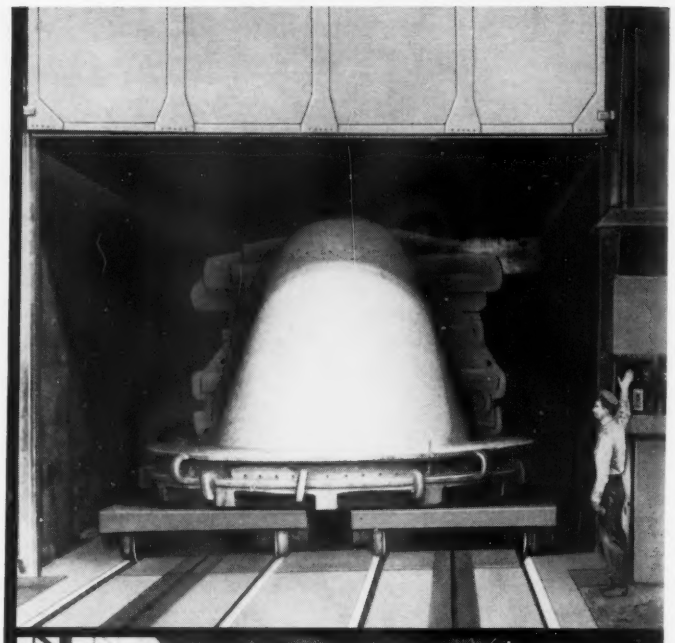
Write for Bulletin 53 C-M

TOP RIGHT—This large car type mold oven is installed at Pittsburgh Steel Foundry. Its patented triple slotted panel construction reduces heat loss 1/3. Fuel savings up to 50% over old conventional methods are possible. Drying time is often cut in half and temperatures are uniformly controlled.

MIDDLE RIGHT—This rack type core baking oven is at the Fremont Foundry Co., Fremont, Ohio. It is equipped with a recirculating combination gas-oil fired heating system.

BOTTOM RIGHT—Vertical Core Oven (unloading position) at A. C. Williams Company, Ravenna, Ohio. This oven is 11'-0" wide x 11'-0" deep x 45'-0" high.

BELOW—Our standard rolling drawer type core baking oven. The heating equipment (not shown) may be mounted on floor beside unit or on the roof. Particularly adaptable to brass and aluminum foundries.



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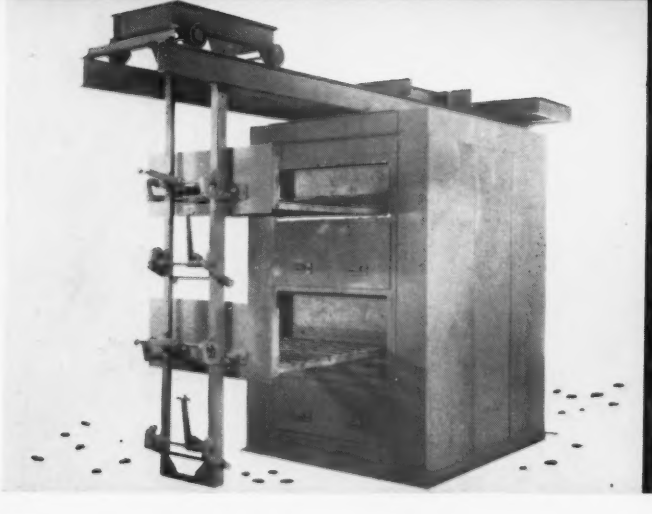


Radiographic Practice With Beryllium-Copper

Develops Procedures for Sand Casting Inspection

PROCEDURES for x-ray radiography of beryllium-copper sand castings recently were developed under sponsorship of the Beryllium Corp., Reading, Pa. The program was based on studies of 60 small castings made of Berylco 20C alloy. Many of these castings were produced so as to include characteristic casting defects.

Penetrometers of red brass and pure copper were used in the determination of suitable exposure times and intensities. Both were found suitable for use with the alloy studied.

Apparent differing densities within some step-formed castings were encountered in preliminary work. This phenomenon was found to be an "optical" effect resulting from positioning of specimens relative to the radiation source and to probable x-ray refractive and reflective effects.

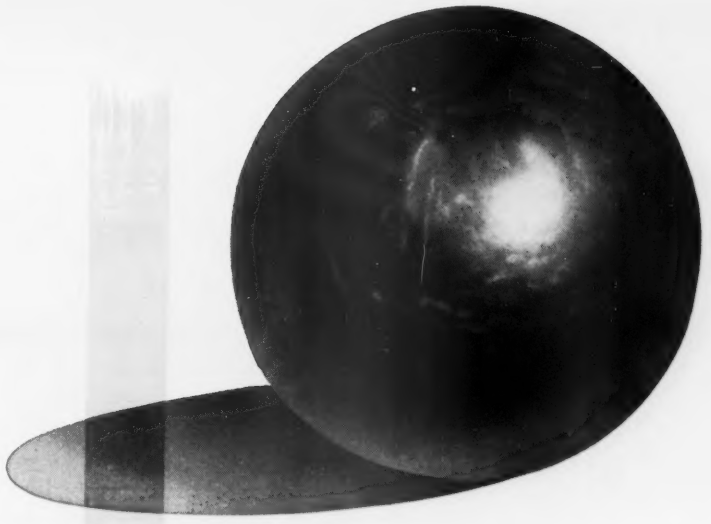
Selected specimens were subjected to specified heat treatments. Other than apparent differences in "texture" of the metal, no significant changes appeared in the post-treatment radiographs.

Casting Defects—Sensitivity of x-rays in disclosing defects in castings was determined in a group of specimens specially prepared with slots of various depths ranging down to 1 per cent of section thickness. It was found that excellent detection of the smallest of these defects could be obtained with machine-finished surfaces but that the roughness of a sand cast surface tended to some degree to obscure small defects.

Specimens showing defects such as porosity and cracks were investigated further by sectioning, grinding and macroetching, also by penetrant dye tests. Frequently porosity not visible in machined surfaces was readily revealed by the macroetch or penetrant dye tests. In thin-section specimens it was found that localized rough as-cast surface areas gave x-ray "indications" that could not be found in cross sections and disappeared when the surfaces were ground smooth.

This investigation did not include any attempt to correlate casting defects with mechanical properties.

High Sensitivity — It was found that the x-ray technique for detec-



A HEAD START

IN STEEL SHOT

QUALITY

Pioneered in 1948, and backed by over 60 years' experience in the manufacture of abrasives, Tru-Steel Shot was the original High-Carbon Fully Heat-Treated Steel Shot of Tool Steel Quality!

Tru-Steel, and only Tru-Steel, has the head start in experience, in manufacturing know-how, in years of solving steel shot blasting problems!

Every heat of Tru-Steel is laboratory tested and controlled to the exacting standards of fine steel making!

Only in Tru-Steel are found the combined characteristics that have been sought for years in metal abrasives — super toughness for resistance to breakage and proper hardness for fast, thorough surface-bright cleaning.

And Tru-Steel is now packaged in 50-lb. double burlap bags — the finest packaging ever devised for metal abrasives — lighter, easier to handle, easier to stack, not slippery like slick, hard-surfaced cardboard cartons.

NOW IN 50 POUND BAG

THERE'S ONLY ONE

TRU-STEEL

Manufactured by

STEEL SHOT PRODUCERS, Inc.

Butler, Pa.

Subsidiary of Pittsburgh Crushed Steel Co.

Pittsburgh 1, Pa.

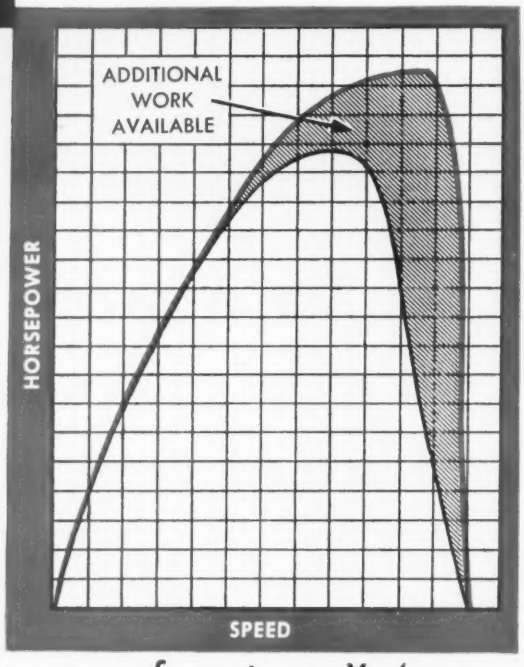
Sold and recommended by

Pangborn Corporation, Hagerstown, Md.

BUCKEYE X-4 ABRASIVE TOOLS

extra power...
same light weight...
greater efficiency...
MORE WORK PER TOOL!

here's proof BUCKEYE X-4 tools deliver extra work



(for even better proof, put an X-4 on your job and get that extra work!)

Look up the toughest metal removal job in your plant, maybe a job that's been fouling up your production schedule for some time. Put a new Buckeye X-4 tool on that job—and stand back!

What happened to the tough job? Why, it's all finished—just like that! And the tool operator's surprised grin lets you know he's never used a tool like this before . . . a tool that whips a tough job quick and easy. With Buckeye X-4 abrasive tools working for you, you'll grin, too—every time you look at that production schedule!

Complete information on these all-new, bright-red Buckeye X-4 abrasive tools will be found in our new Catalog A-10. We'll be glad to send you a copy . . . just tell us where and to whom.

USING BUCKEYE ABRASIVE TOOLS NOW? HERE'S GOOD NEWS!

You can get X-4 performance from your present Buckeye D, E and F Series grinders, buffers and sanders. Just tell us code names and serial numbers of tools you are now operating and we'll tell you how.

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producers of the world's first successful rotary air tools

tion of flaws in these beryllium-copper castings is capable of sensitivity greater than the accepted 2 per cent of section thickness, provided surface conditions do not interfere with the sensitivity. Two per cent is the normal anticipated limit of sensitivity in radiographic practice for heavy metals. (Sensitivity is 3 per cent for magnesium and its alloys.)

Since as-cast surfaces exert a relatively greater influence in radiography of thinner sections, such as ⅛-in., indications obtained with these castings should be viewed with caution. It is possible for some indicated flaws to be the effect of surface irregularity alone.

When porosity is present in the casting, it may not be revealed by machining operations alone; that is, assuming the machined face passes through the area of porosity.

Optimum settings with the radiographic equipment used were as follows:

Section Thickness, in.	Voltage, kv	Current, ma	Time, min.
1	218	12	7
½	200	10	4
¼	140	10	4
⅛	120	10	1.5

This equipment was used: X-ray source—Westinghouse 218KV Industrial x-ray unit. Source location—Perpendicular to and 36 in. from plane of film. Film — Eastman Kodak Type M, between two 0.005-in. lead sheets. Processing materials—Eastman Kodak liquid developer and fixer. Processing conditions—Temp. 68°F, develop 4 minutes, fix 8 minutes. Penetrometers—Red brass and copper made in accordance with specification MIL-I-6865A.

Book Review

The MMH Materials Handling Manual, 384 pages, 8¼ x 11¼ in., published by Boston Publishing Co., 795 Boylston St., Boston 16, Mass. Price $5.

First volume of a basic reference and working text covering all phases of material handling, this book has been edited for material handling specialists and engineers. Manual contains over 400 illustrations and sketches as well as many tables and graphs. Material is written from an engineering standpoint with emphasis on methods as well as applications. Over 30 contributors well known in the industry, educators, government specialists and consultants are represented in the various sections.

Smith L-O Core Oil

Ask the fellows who use core oil and they'll tell you Smith L-O is a natural. That's because experience has proved to them that Smith L-O results in better, cleaner, stronger cores. And—through its controlled uniformity and high quality, those attributes show up every time. But product alone is not the entire reason for the use of Smith L-O in major foundries throughout the country. Production men also look for the advice and recommendations of experienced Smith Foundry Service representatives.

Whenever you need assistance, look first to Smith L-O . . . the name that stands for a service as well as a product.

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Smith L-O Core Oil

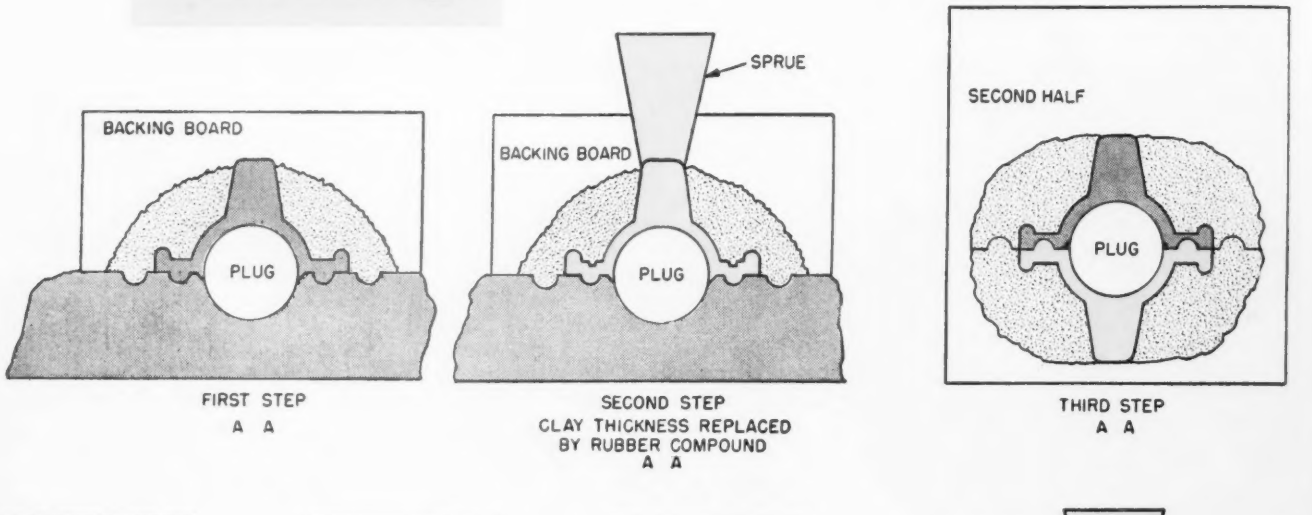
ROD DIP LIQUID PARTING

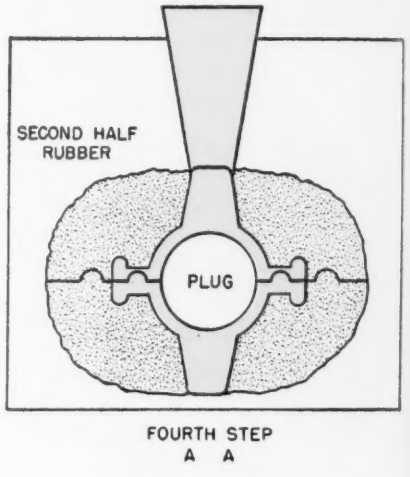
SMITH OIL & REFINING CO.

INDUSTRIAL OILS DIVISION • ROCKFORD, ILLINOIS

Trouble Shooting

By C. W. AMMEN





Illustrations above show four steps in making a simple rubber mold for casting complicated plugs. All the drawings are sections through the molds at right angles at points marked AA in the drawing below, a side view of a completed rubber mold for making plaster core plugs

Plaster Plugs from Rubber Molds

Dear Charlie:

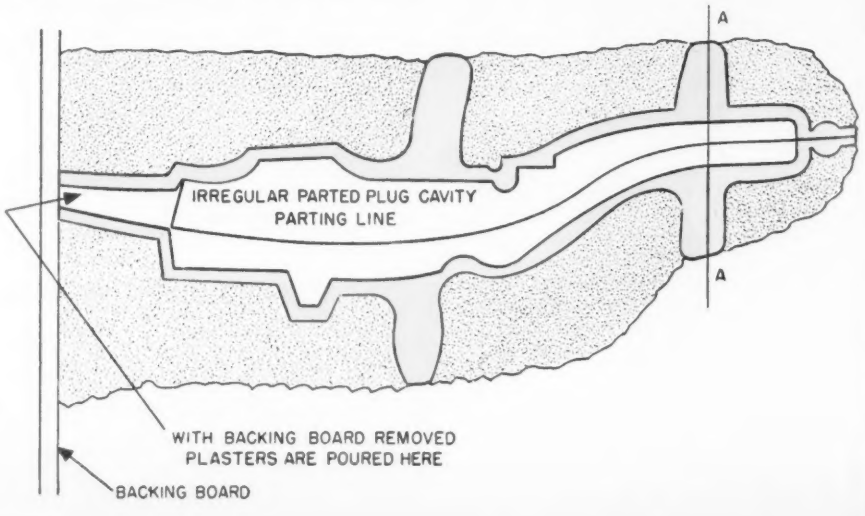
Making multiple cavity coreboxes and driers for small, delicate and sometimes complicated cores, we have considerable trouble producing the duplicate core plugs in the plaster from which we make the corebox and drier patterns. The big rub comes in getting the plugs out of the plaster mold in which they are cast. Breakage is high, and damage to the plug mold occurs on occasion. The trouble is worse when the parting through the plug is not on a flat plane, and we have tried various plaster partings with varying success. When we have to duplicate the equipment at a later date, we often find the plaster plug mold dry, brittle and otherwise unusable. A split plug on a flat plane, where the plug halves are made separately, is not so bad, but the little, irregularly parted solid plaster plugs give us fits.

Sincerely,
Sam

Dear-Sam:

It may seem like a lot of work but in the long run you can produce a much better and cleaner job if you make a simple rubber mold for casting complicated plugs. In fact, I have seen a rubber mold made to produce the plasters for the corebox proper and for the drier. I fully agree with you that some plaster core plugs are doggoned tough to remove from a full plaster mold. Losing the plugs from your final casting of the box is no great loss since you have what you want at that stage of the game.

About the easiest material I have found to make rubber plug molds is a rubberlike plastic material (plasticized polyvinyl chloride) which can be had from various sources and costs about $2 per lb. It melts to a good pouring viscosity at about 260 to 350° F and is available in several varieties. Relatively accurate, it requires no surface treatment, has



Shell molds bonded with **RESINOX*736** have outstanding strength—even at 3100°F.!

Typical ESCO steel alloy castings molded in shells bonded with Resinox 736. Note the smooth finish and sharp detail which is achieved without costly machining.

Leading alloy steel foundry selects Monsanto's phenolic resin to reduce casting costs!

By shell casting alloy steel parts that formerly had been forged or welded, the Electric Steel Foundry Company, Portland, Oregon, is reducing cost of some parts by as much as 60%!

Since 1951 the company has standardized on bonding shells with Resinox 736 because of its outstanding performance and versatility. Machine finishing has been virtually eliminated. Excellent detail and close tolerances are maintained, together with conservation of material.

The excellent hot strength of shells bonded with Resinox 736 is particularly appreciated at ESCO. On some jobs steel alloys are as hot as 3100° F. when poured into molds.

According to John Oettinger, the company's shell molding project engineer, "Resinox 736 combines *desirable* compromises in the many factors to be considered in a bonding agent. Our use of this material has enabled us to upgrade the castings we specialize in for both manufacturing and processing equipment."

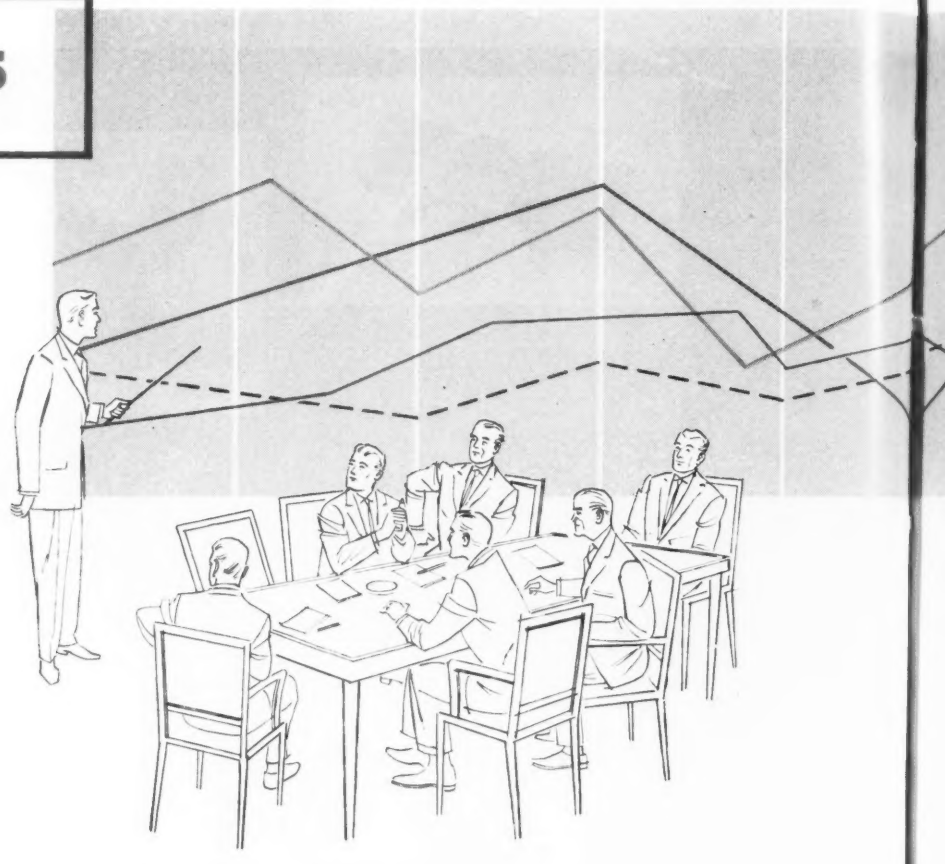
Because the economy and quality of shell molding depends so much on the resin used, it will pay you to investigate Resinox. 736 is suitable for most applications. Other Resinox phenolic resins are available to meet special problems.

All Monsanto resins are research-developed and shop-tested to meet your foundry needs. For data sheets and complete information on shell molding, core binding and sand conditioning resins, write Monsanto Chemical Company, Plastics Division, Room 447, Springfield 2, Massachusetts.

MONSANTO

*Resinox: Reg. U. S. Pat. Off.

1975



To anyone satisfied with business as usual it's a long way off.

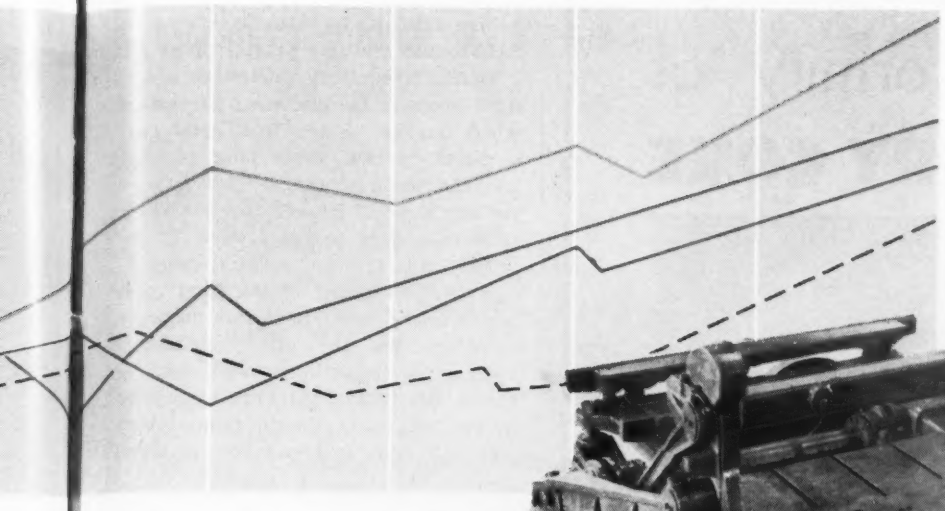
To cautious government researchers it's a graph. The life line starts "back in 1950" and climbs day by day to a 100% increase in gross national product; a 27% increase in population and labor force; a 62% increase in castings production.

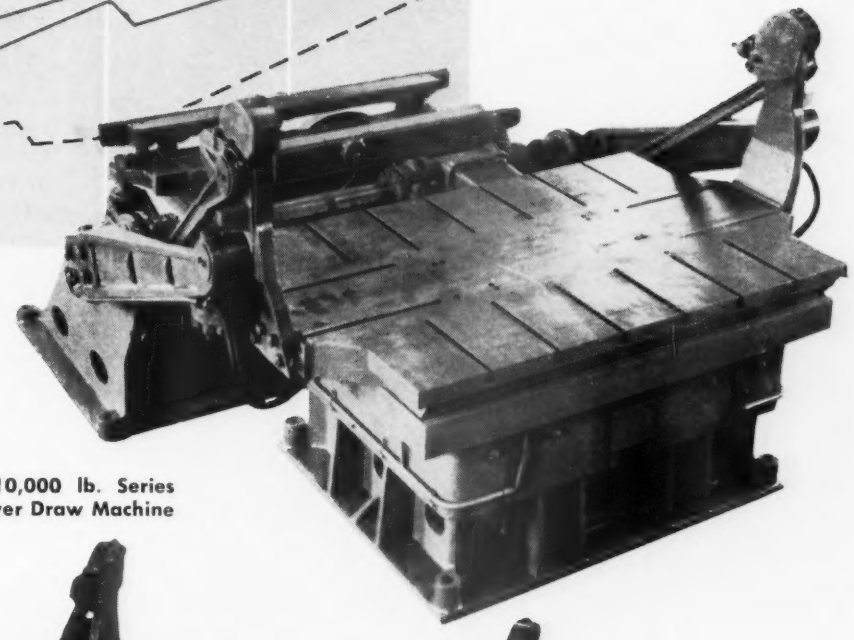
To aggressive foundrymen it's a whopping order for 26,429,000 castings — castings made by founders farsighted enough to keep up to date . . . practical enough to think of 1975 in terms of today's plant layout, and production equipment.

To Herman it is a challenge to continue supplying you with molding machines which do a superior job no matter what the calendar says . . . molding machines like the two 10,000 lb. series used by a leading national railroad specialty steel foundry. These two machines, with one operator and one helper on each, have produced 210 railroad bolster molds in a 10-hour molding shift operation.

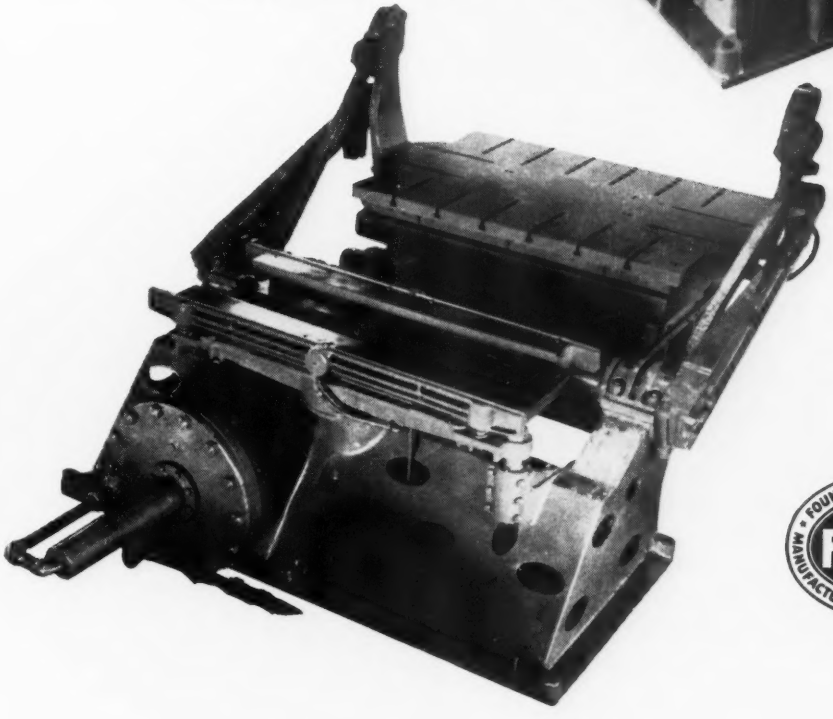
We operate on the principle that our business is really your future.

THE HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH 22, PA.





Herman 10,000 lb. Series
Jolt Rollover Draw Machine

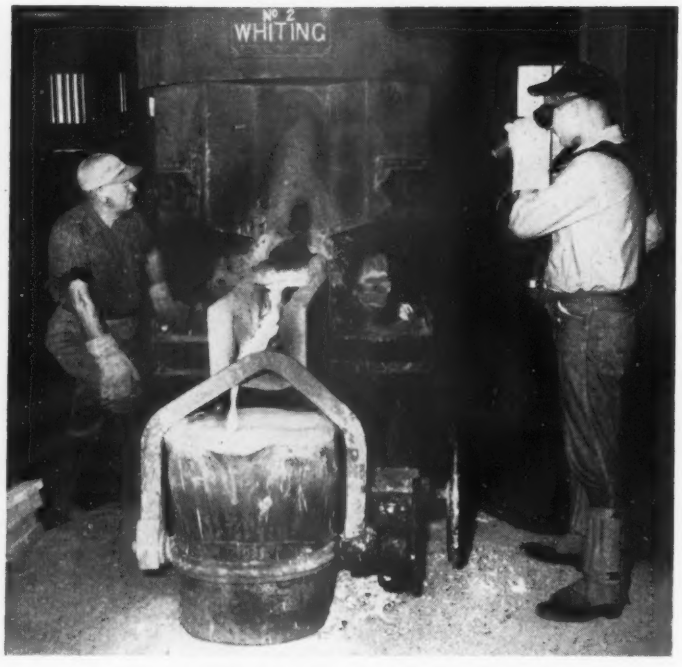


FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

HERMAN

Best Known Name in Molding Machines

ABC's Test Cupola Helps Maintain Uniformity of **ABC FOUNDRY COKE**



Test cupola is lined to 27" inside diameter and equipped with modern blast controls.

ABC is the only merchant coke producer that operates a test cupola for checking coke performance and carbon absorption as a part of its research and laboratory testing program.

ABC's test cupola has been operated regularly since 1944 by personnel from the Company's Research Department in coordination with its service engineers. In combination with usual chemical and physical tests, the test cupola has proved its value in forecasting coke performance, improving quality and maintaining that uniform quality for which ABC foundry coke is so widely recognized.

Your inquiries are invited.

ALABAMA BY-PRODUCTS CORPORATION

General Sales Office: First National Building, Birmingham, Ala.

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GREAT LAKES FOUNDRY SAND COMPANY, Detroit; ST. LOUIS COKE & FOUNDRY SUPPLY COMPANY, St. Louis; THE RANSON AND ORR COMPANY, Cincinnati; KERCHNER, MARSHALL AND COMPANY, Pittsburgh; BALFOUR, GUTHRIE & COMPANY, LTD., San Francisco; ATWILL COKE AND COAL COMPANY, Chicago

great elasticity and can be used repeatedly. I buy it from a local dental supply house. Of course molds also can be made of gelatin (a refined animal glue), vinyl compounds, rubber latex and synthetic rubber.

To make multiple plaster plugs for a small, irregularly parted core, the first step is to make an oversized wood master. From this, sand cast a metal or cast stone plug (do not use the wood master to make your rubber mold). Finish the metal or cast stone plug to the desired dimensions, taking into account shrinkage during casting of the final core-boxes and driers. It is not necessary to allow for any other shrinkage, such as in the rubber mold. Having made the plug, you are ready to make the rubber mold from which you can cast any number of exact duplicates.

How To Make the Rubber Mold

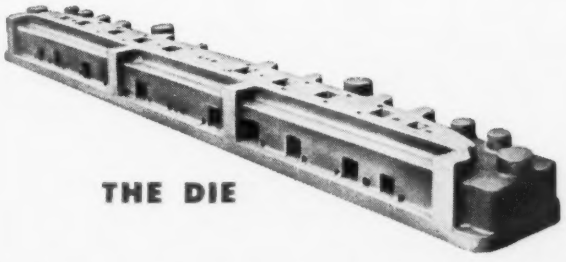
The plug should be brushed with a light coat of shellac and should be very dry. Bury it in a modeling clay bed and make the parting. The latter should be done as neatly as possible and should be beveled slightly inward at the parting line. Then cut a registration groove around the pattern, about ½ in. from it. Dust a little dry parting over the entire face and lay clay strips about ⅜ in. thick over the pattern, pressing them down into the hollow areas carefully enough not to affect the thickness.

Then build a ¼ in. ridge around the outer edge of the clay cover. This will serve to hold the final rubber in position with respect to the plaster backing shell. Cut a second registration groove around the pattern, this time ½-in. from the outer edge of the clay just applied. This step is to register the plaster backs. Next, build up a couple of downgates (sprues) with clay on top of the clay buildup.

At this point, build up a plaster back by applying plaster mixed with hemp fiber or hair, reinforcing with wood strips where they are deemed necessary. Everything is covered except the tops of the downgates. When the plaster has set, take away the shell and carefully remove the clay buildup, the ⅜-in. section, taking great care not to disturb the plug or the registration grooves around the parting.

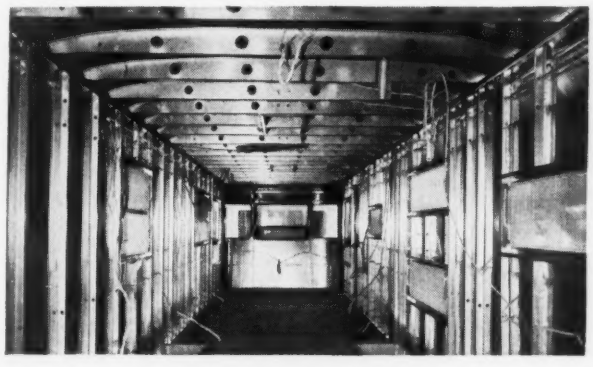
Shellac the inside of the plaster shell and rub it with vaseline or vegetable shortening until the entire inner face is greasy and shiny. Put the shell back into position over the plug, in its registration groove. Mud around the edge to prevent a runout, and place a couple of home-

AT NEMCO FOUNDRY: ANOTHER PROBLEM SOLVED BY CITIES SERVICE CORE OIL



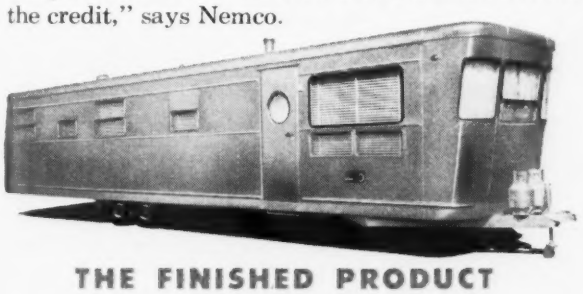
THE DIE

The die pictured here was cast at Nemco Foundry for use by the Spartan Aircraft Company in producing roof ribs for its Spartan Mobile Home. Difficult to produce, it required 10 cores 2⅝″ x 2⅝″ square and 25 cores, quarter-circle in shape, from ¾″ to 1″ in diameter. Semi-circular shape was necessary to core curved slots from top of die to sides. Holes had to be clean and free from obstruction, allowing stamped slugs to fall through. Nemco relied on Cities Service Delco Core Oil to help meet exact specifications. "A smart choice," says J. A. Dean, General Manager. "Delco Core Oil made the job far easier."



THE ROOF RIBS

The roof ribs of this Spartan trailer, cast from the die produced at Nemco, are visual proof of a job well done. "The great strength and high collapsibility of Cities Service Delco Core Oil share a lot of the credit," says Nemco.



THE FINISHED PRODUCT

The finished product is this handsome Spartan Mobile Home awaiting shipment to consumer. Spartan's rigid specifications help make it one of the safest and best on the market.

Difficult casting of die to form roof ribs for Spartan Mobile Home made easier by Cities Service Delco #36

Located in Tulsa, Oklahoma, Nemco Foundry enjoys attacking the really tough jobs and making them easier. And often helping to spearhead the attack is Cities Service, as described here by J. A. Dean, General Manager:

"Recently Cities Service Delco #36 Core Oil again solved a tough job for us in fulfilling the requirements for a casting for the Spartan Aircraft Company, makers of Spartan Mobile Homes. The casting was a bottom shoe for blanking die to make roof ribs for the all-aluminum shells for Spartan trailers.

"The die was of Nemcoloy, Type AL, an alloyed grey iron. It was 106″ long, 8″ thick and 13½″ wide, and weighed 2,018 lbs. cleaned.

"It required 10 cores 2⅝″ x 2⅝″ square. In addition, it demanded 25 cores, quarter-circle in shape, ranging from ¾″ to 1″ in diameter. Semi-circular design was necessary in order to core curved slots from the top of the die to the sides of the die. Holes had to be clean and free of obstructions allowing the stamped slugs to fall through the die to the outside and not hang up.

"Cities Service Delco #36 Core Oil enabled us to meet these requirements perfectly. We certainly recommend it where great strength and high collapsibility are needed."

Like Nemco, scores of other foundries have reported unusual results with problem-solving Cities Service Core Oils. Nor does the praise end with the product . . . for time and again the solution for the proper core oil has resulted from the knowledge, understanding and experience of a Cities Service Lubrication Engineer. If you have a lubrication problem, why not talk it over with one of these Cities Service experts? Or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

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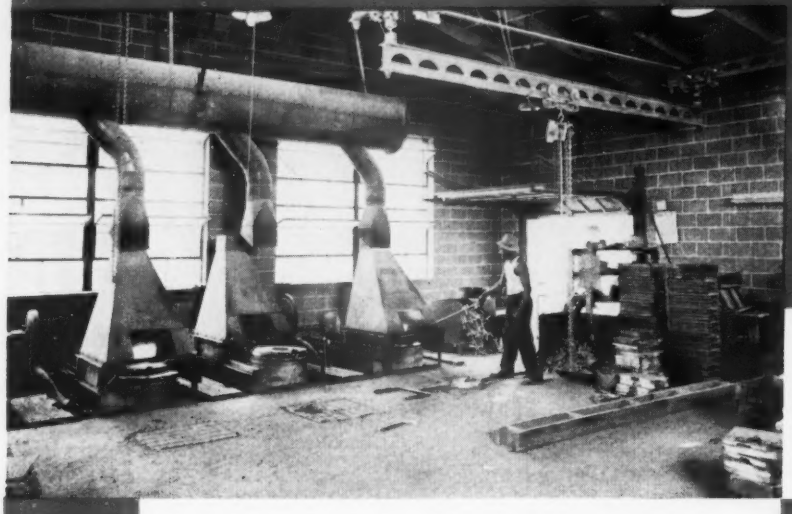
QUALITY PETROLEUM PRODUCTS

"ON THE RECORD"

CRUCIBLE *Melting*

THE MODERN METHOD!



Three of the four oil-fired furnaces with No. 60 Crucibles, in the new quarters of O'Hare Brass & Aluminum Foundry Company of St. Louis, Mo. Crucible capacity 200 lbs. brass or 60 lbs. aluminum. Note roll-back fume hoods and excellent housekeeping.

Crucible melting belongs in the up-to-date, modernized non-ferrous foundry as shown in the illustration of an old-established company moved into new quarters.

Crucible melting completes the picture of overall efficiency and economy required to produce high quality castings in a highly competitive market.

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CRUCIBLE MANUFACTURERS ASSOCIATION

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Write for your free copy of the new 8½ x 11, 32-page revised Crucible Melters' Handbook.

THESE FIRMS CAN TAKE CARE OF ALL YOUR REQUIREMENTS FOR CRUCIBLE MELTING

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ROSS-TACONY CRUCIBLE CO.

made metal funnels in the downgates. Melt the plasticized polyvinyl chloride in an enameled pot over a hot plate upon which you have an asbestos pad to temper the heat somewhat. Stir it with a wooden paddle continuously to prevent scorching.

With the aid of a candymaker's thermometer remove the pot when the material is at 275° F and allow it to set until the bubbles have risen to the surface and dispersed. Then pour it into the mold and allow it to set 4 to 6 hours. The opposite half of the mold is constructed the same as the first half, except that the plug is set into the newly made rubber mold and shell. To prevent the two halves of the rubber mold from welding, part this edge with castor oil and pour the second rubber somewhat cooler.

Up to this point I have neglected to allow for an opening in the finished mold for making the cast plugs. Do this by putting a suitable gate on the plug and working it against a backboard. If you desire, you can use one of the cold compounds available for this type of work, a flat back or a straight plane parted plug made in halves. The mold is produced by placing the heated dry pattern on a piece of glass and placing a ring around it which is filled with the compound. Castings are removed by pushing on the back of the compound to pop them out.

Vegetable Shortening Gives Release

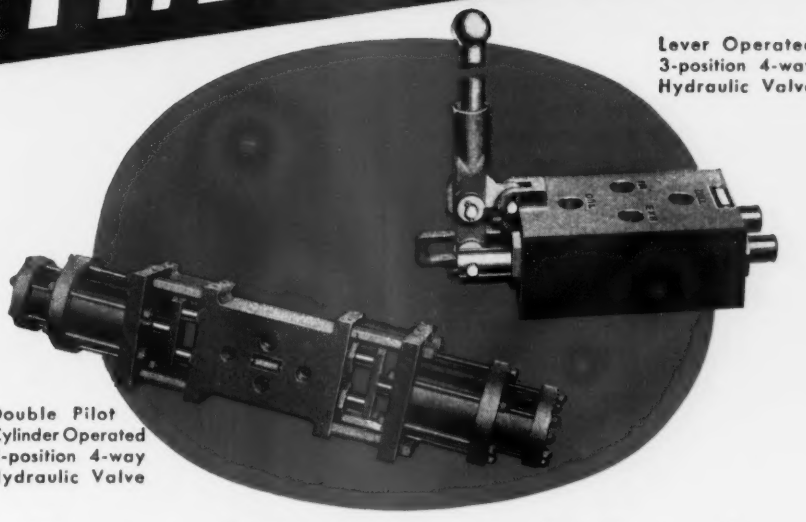
To get a release from plaster, coat the plug or what have you with vegetable shortening and place it in the refrigerator long enough to harden. When the plaster is hot and hard enough to handle, remove the plug. The heat from the plaster will melt the shortening and makes it a very good release agent.

Duplication of pattern equipment from fine, detailed, unreplaceable plaster or metal masters can be done with complete satisfaction and without fear of damage to the masters or loss of detail by making a rubber mold to produce all the copies you desire.

Some time ago in New Orleans, I was called upon by an antique dealer to reproduce three missing quadrants of brass fancy work around the face of a very old and beautiful grandfather clock. To make a copy of the existing piece by making a female plaster and then catching a male plaster from the female to use as a pattern was nothing short of folly.

We mounted the original piece in a corebox and attempted to make a core mold from it, but loss of de-

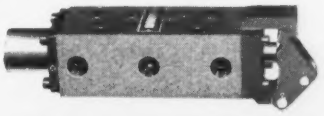
Quick-As-Wink®
HYDRAULIC VALVES



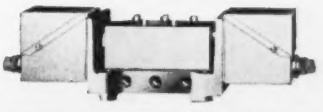
Hand and Pilot-operated Types for Water or Hydraulic Oils to 5000 psi.

• Quick-As-Wink Hydraulic Control Valves meet the most exacting requirements. These valves are fully balanced in any position. Patented design includes hydraulically balanced U-packers. Packers are floated while crossing the valving ports, thus assuring long life, and expanded by internal valve pressure to provide a tight seal. Maintenance is extremely low and usually can be done quickly in the field, avoiding the delay of returning valves to the factory for servicing, or the need of maintaining large standby inventories. For long, dependable, trouble-free service, specify Quick-As-Wink Hydraulic Valves. Write for Bulletin No. 531 and the fully descriptive Data Sheets. They give complete details. Write *today!*

Ask us also about . . .



CAM OPERATED SINGLE PLUNGER VALVE ⅜" to ¾" sizes. Operated by rotating cam or land on reciprocating device.



DOUBLE SOLENOID "O-TYPE" VALVE for pressures up to 125 psi. Widely used as pilot valves and for operating air cylinders.

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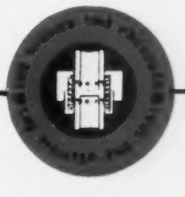
AIR AND HYDRAULIC
Control Valves



Hand, Foot, Cam, Pilot, Diaphragm and Solenoid Operated

Mfd. by C. B. HUNT & SON, INC., 1978 East Pershing St., Salem, Ohio

tail and an even rougher casting ruled this method out. The original had many undercuts which could not be handled without risking total loss of our only piece to work from.

A rubber mold then was made of the original and a plaster made from the rubber mold so that we could remove both the original and the cast from the rubber, regardless of defects and undercuts. With an exact duplicate of the original in plaster, it was a simple matter to work draft carefully on the plaster and correct its faults. It then was shellacked to a flat plate, put up in a very fine sand and dried, and an excellent casting was produced. We replaced all four, keeping the one original. After patina and installation, no one could ever recognize that they were not the original pieces. Many times since then I have copied originals by making a rubber mold.

You will find countless uses for the technique in the patternmaking game once you have the knack of it.

Sincerely,
Charlie

Banks Provide Business Help

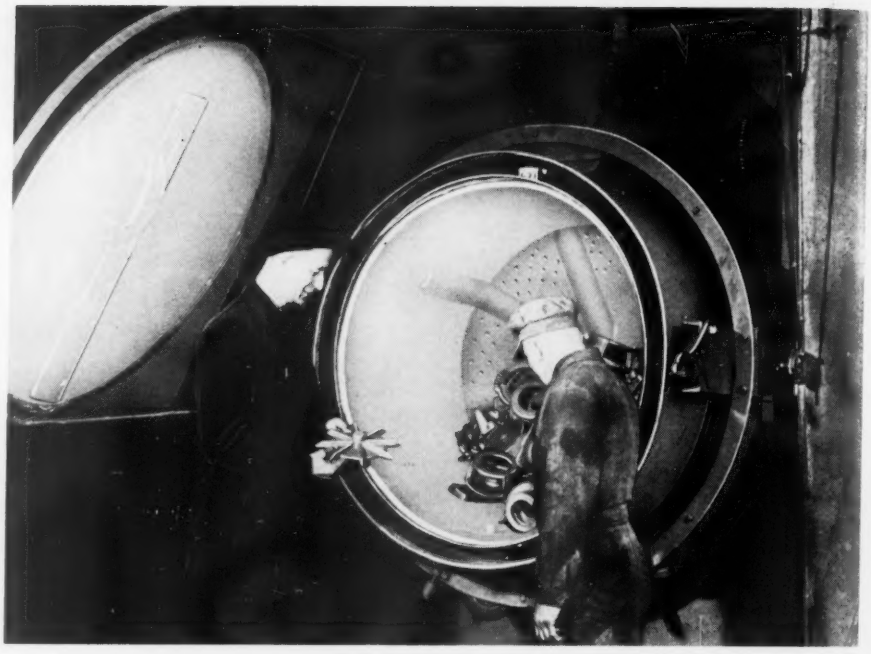
Small business owners should look to their commercial bankers as sources of valuable management help as well as credit sources, according to leaflet 68 in the Small Business Administration's series of management aids, available free from any of the agency's field offices.

Leaflet points out that, in addition to money lending, banks may offer some or all of these advisory services: Financial management assistance; trust information; help in finding and placing management personnel; guidance on credit policies; aid with record keeping, and reporting and analyses of current and future business conditions.

Book Review

Transactions of the American Foundrymen's Society, cloth, 8¼ x 11¼ in., published by the American Foundrymen's Society, Des Plaines, Ill. Price $15.

Vol. 63 of the American Foundrymen's Society's annually published transactions contains the technical papers and other proceedings of the 59th annual meeting held May 23-27, 1955 at Houston, Tex. It also includes the president's annual address, treasurer's report, financial statements, general manager's report, analysis of society membership, minutes of board of directors meetings, report of chapter officers conference and a summary of research projects.



Abrasion resistant rubber lining bonded inseparably to steel liner of shot blast cleaning barrel shows only minimum wear after two-years' use

Rubber-Lined Tumbling Barrels Reduce Cleaning Costs

REDUCED noise, minimized casting breakage, trouble-free operation and longer abrasive life are benefits accruing to C & G Foundry & Pattern Works Inc., Indianapolis, since the firm successfully adapted a rubber-face lining for use in its abrasive shot blast cleaning barrels.

The foundry ships about 1 million lb of gray iron castings monthly, as well as about 30,000 lb of brass, bronze and aluminum castings. Castings range in size from a few ounces to 16,000 lb and are used in automotive, road and construction machinery and in wheel drum, drive pulley, gear blank, machine tool, refrigeration, trackless trolley and glassmaking machinery applications.

About ten years ago, C & G was faced with a never-ending replacement and repair problem with steel liners in its cylindrical tumbling barrels. Abrasive shot, striking against the liner with considerable velocity, wore through the liner in about four months. An additional two months of life could be gained by regular welding repair.

Vice President Don C. Moore began a series of experiments to determine whether a rubber facing could be attached to the liner to extend its usefulness. Early experiments were only partially successful because the abrasive tended to erode screw heads and tear the rubber sheet from its mounting. Further experimentation and consultation with engineers from Gates Rubber Co., Denver, solved the problem.

Now, the barrels are lined with a ¾-in. sheet of abrasion resistant rubber bonded to the steel liner. Rubber sheet segments are screwed to the liner plate, and screw heads are countersunk. Screw head recesses are covered with a rubber plug. Joint segments toss castings inside the barrel as it rotates gently. Abrasive shot blasts the castings and bounces off the rubber facing rather than off the steel liner.

The large steel barrel illustrated has been operating more than two years and has required no repairs of any kind to its rubber-faced lining. A close examination of the lining reveals only minimum wear after that length of service. At C & G, barrels with this type of lining have proved ideal for production cleaning of medium-sized castings. Large castings are cleaned occasionally in the same cylinders, but by intermittent rotation and blasting rather than by continuous rotation of the cylinder.

New Foundry List

now available

for immediate delivery.

Who? Where?

Metals Melted?

Melting Equipment & Capacity?

Departments Operated?

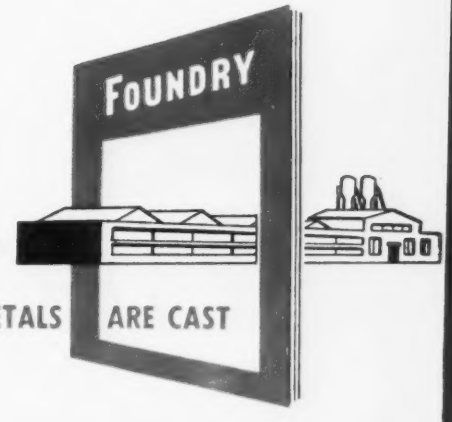
Casting Methods?

• For many years, FOUNDRY has conducted an intensive census of the foundry industry in the United States and Canada . . . every two years, basic information on all foundries is published in *Penton's Foundry List and Directory.*

The 1955-56 Edition of PFL is now available. It gives comprehensive information on all of the 6,208 metal casting plants in the U. S. and Canada. It tells who they are and where they are located; what metals they melt, their melting equipment capacities, and departments operated.

Well-indexed, and in loose-leaf form, PFL is useful to casting buyers and foundry suppliers. For prompt delivery, write: Book Department, FOUNDRY, 1213 West Third St., Cleveland 13, Ohio.

PRICE: $100 PER COPY
orders now being taken for immediate delivery.



Serving Foundrymen

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50%

THOR'S new 7½ pound vertical air grinder is more powerful, more versatile. It can save time and money in your operation. Check these features to see how:

Completely streamlined, one piece housing encloses everything but spindle and sanding disc or cup for easier, safer handling.

Available at three basic speeds—4500, 6000, or 8000 r.p.m's.

All models supplied with four position throttle for operator convenience.

Can accommodate sanding discs up to 9" diameter, depressed center wheels up to 7" diameter, cup wheels and wire brushes up to 6" diameter.

Handles spaced at 110 degree angle to facilitate operator handling, lessen fatigue.

Extremely quiet exhaust.

Thor quality construction includes:

Automatic mist oiling for all moving parts from a large capacity reservoir • new, adjustable type positive speed governor, long lasting • easy disassembly for maintenance inspection • spindle is mounted on double row, pre-loaded ball bearings to take thrust of extra power • lower bearing grease fitting • hardened steel center plates • clamped rotor to prevent wear on end plates • very low air consumption.

For price or more complete information on your own particular application contact your nearest Thor factory branch listed below.

Cup grinding wheel with stationary guard

6" wire brush with stationary guard

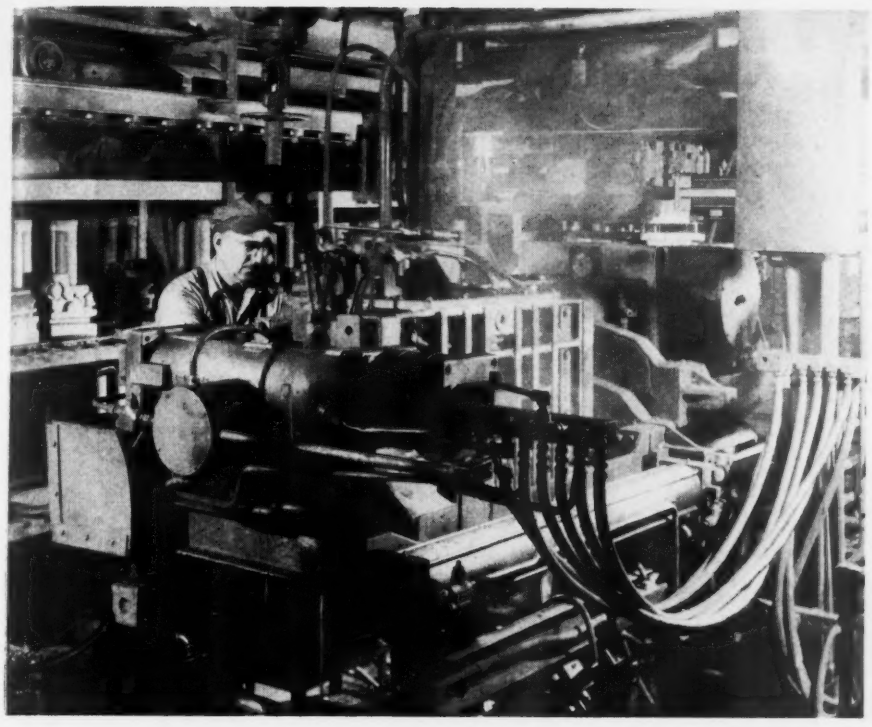
Thor
PORTABLE POWER
TOOLS

9" sanding disc

Depressed center wheel

THOR POWER TOOL COMPANY, AURORA, ILLINOIS

Atlanta • Birmingham • Boston • Buffalo • Chicago • Cincinnati • Cleveland • Denver • Detroit • Houston • Los Angeles • Milwaukee • Newark • Long Island City, N.Y. • Philadelphia • Pittsburgh • St. Louis • San Francisco • Seattle • Toronto, Canada • Export Division, New York City



One of the coreblowing machines turns out 6-cylinder engine barrel cores handled in giant oven

Big Oven Can Bake . . .

1560 Cores an Hour

By ROBERT H. HERRMANN
Associate Editor

ONE of the largest horizontal core-baking ovens in the world was put into partial production recently at the Chevrolet-Saginaw Grey Iron Foundry Division of General Motors Corp., Saginaw, Mich. It was built over a 40-ft-wide road between the coremaking and maintenance buildings. Main dimensions of the oven are 280 ft long, 26 ft 6 in. wide, and 9 ft 7 in. high.

Seven automatic coreblowing machines and ten hand-ram rollover machines produce the cores handled by the oven. Currently the oven is baking 921 six-cylinder barrel cores per hour at an oven conveyor speed of 95 in. per minute. However, at this conveyor speed with carrier shelves fully loaded, it is possible to convey 1560 cores per hour through the oven.

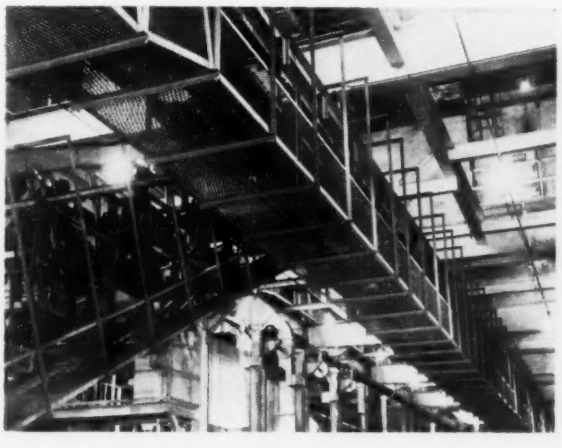
Cores are baked at 420° F for 1 hr 45 minutes and are cooled for 1 hr. The 2017-ft-long double angle track trolley conveyor is looped to make three passes through the baking zone and two in the cooling zone. Suspended from the conveyor on 88-in. centers are 275 double shelf carriers. Each holds 24 cores.

Static weight on the conveyor is high. Cores weigh 43 lb, steel pipes and arbors 8 lb, and the steel driers 11.32 lb. Total core assembly weight is 62.32 lb. Carriers hold 24 assemblies which weigh 1495.68 lb. With the weight of the carrier, 600 lb, added, the total load on each hanger is 2095.68 lb. The entire conveyor thus carries a load of a little over 288 tons.

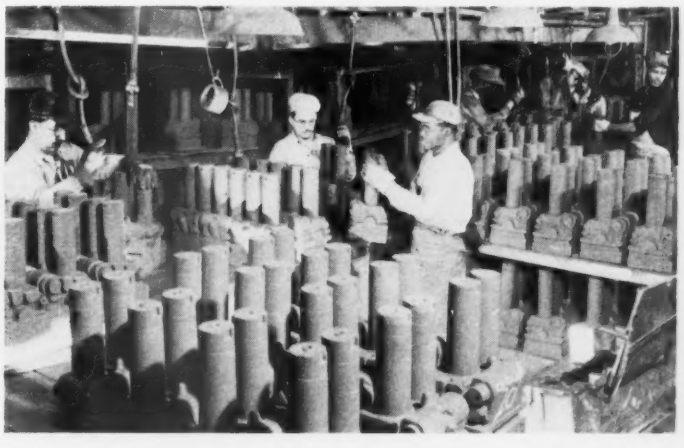
Power to move the conveyor is supplied by a 5-hp, 1750-rpm motor through a variable-speed pulley drive. In addition, a 1½-hp helper drive also assists the automatic take-up device take up slack in the drive. An automatic lubrication system services conveyor trolleys.

The recirculating heating equipment is gas or oil fired. Provision is made to supply air to the cooling zone at 64,000 cfm and to exhaust air at 65,000 cfm.

The oven installation was made by Palmer-Bee Co., Detroit, J. O. Ross Engineering Corp., New York, and R. C. Mahon Co., Detroit.

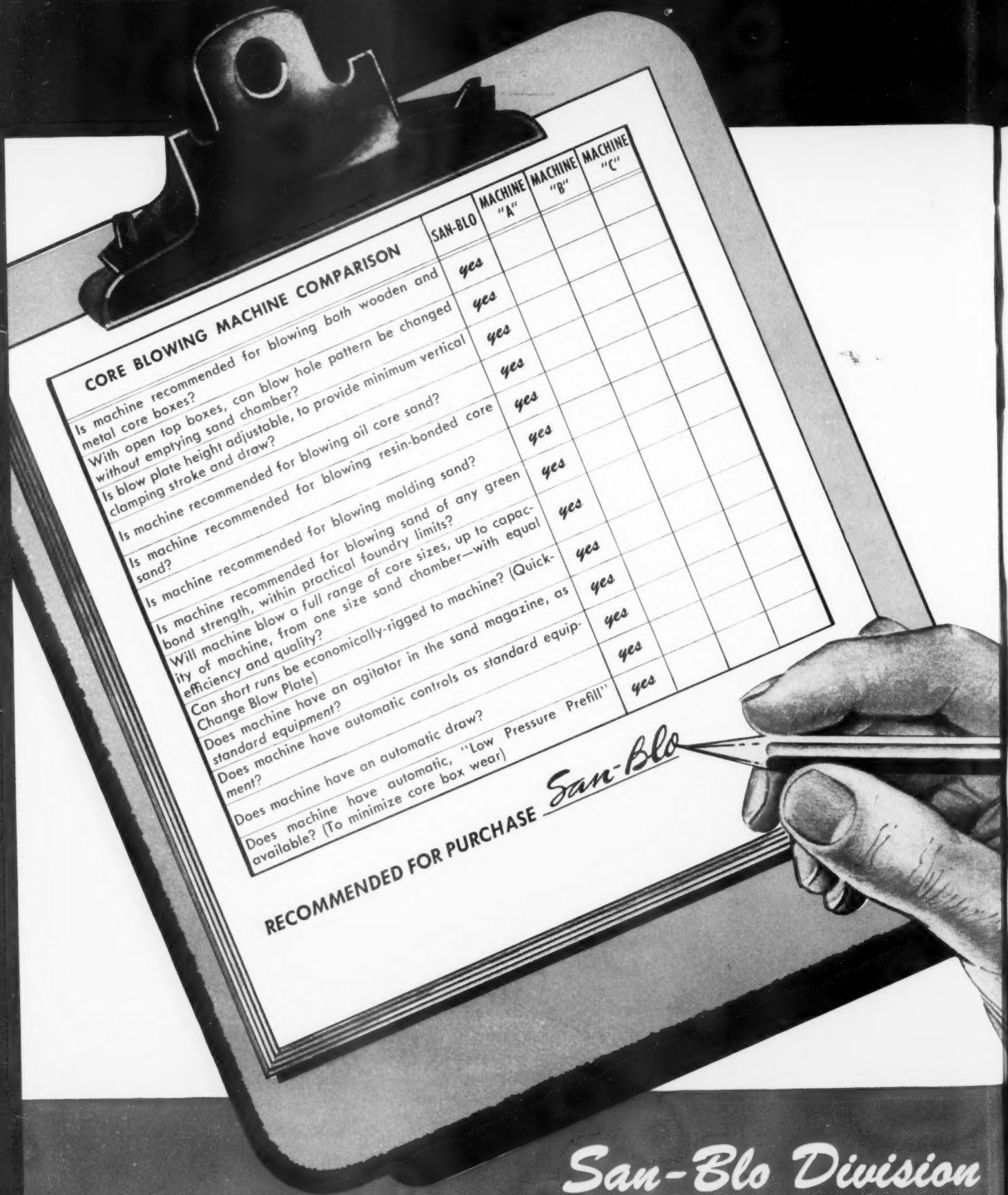


Baked cores come down from oven as empty conveyor under oven returns to the coreblowers



Conveyor is unloaded and rough edges are trimmed off the baked cores. The conveyor carries a load of a little over 288 tons

MORE VALUE FOR YOUR MONEY



CORE BLOWING MACHINE COMPARISON

	SAN-BLO	MACHINE "A"	MACHINE "B"	MACHINE "C"
Is machine recommended for blowing both wooden and metal core boxes?	yes			
With open top boxes, can blow hole pattern be changed without emptying sand chamber?	yes			
Is blow plate height adjustable, to provide minimum vertical clamping stroke and draw?	yes			
Is machine recommended for blowing oil core sand?	yes			
Is machine recommended for blowing resin-bonded core sand?	yes			
Is machine recommended for blowing molding sand?	yes			
Is machine recommended for blowing sand of any green bond strength, within practical foundry limits?	yes			
Will machine blow a *full* range of core sizes, up to capacity of machine, from one size sand chamber—with equal efficiency and quality?	yes			
Can *short runs* be economically-rigged to machine? (Quick-Change Blow Plate)	yes			
Does machine have an agitator in the sand magazine, as *standard equipment*?	yes			
Does machine have automatic controls as standard equipment?	yes			
Does machine have an automatic draw?	yes			
Does machine have automatic, "Low Pressure Prefill" available? (To minimize core box wear)	yes			

RECOMMENDED FOR PURCHASE *San-Blo*

San-Blo Division

The **FEDERAL FOUNDRY SUPPLY** *Company*

4600 EAST 71st STREET • CLEVELAND 5, OHIO

CHICAGO • DETROIT • LOS ANGELES • MILWAUKEE • NEW YORK

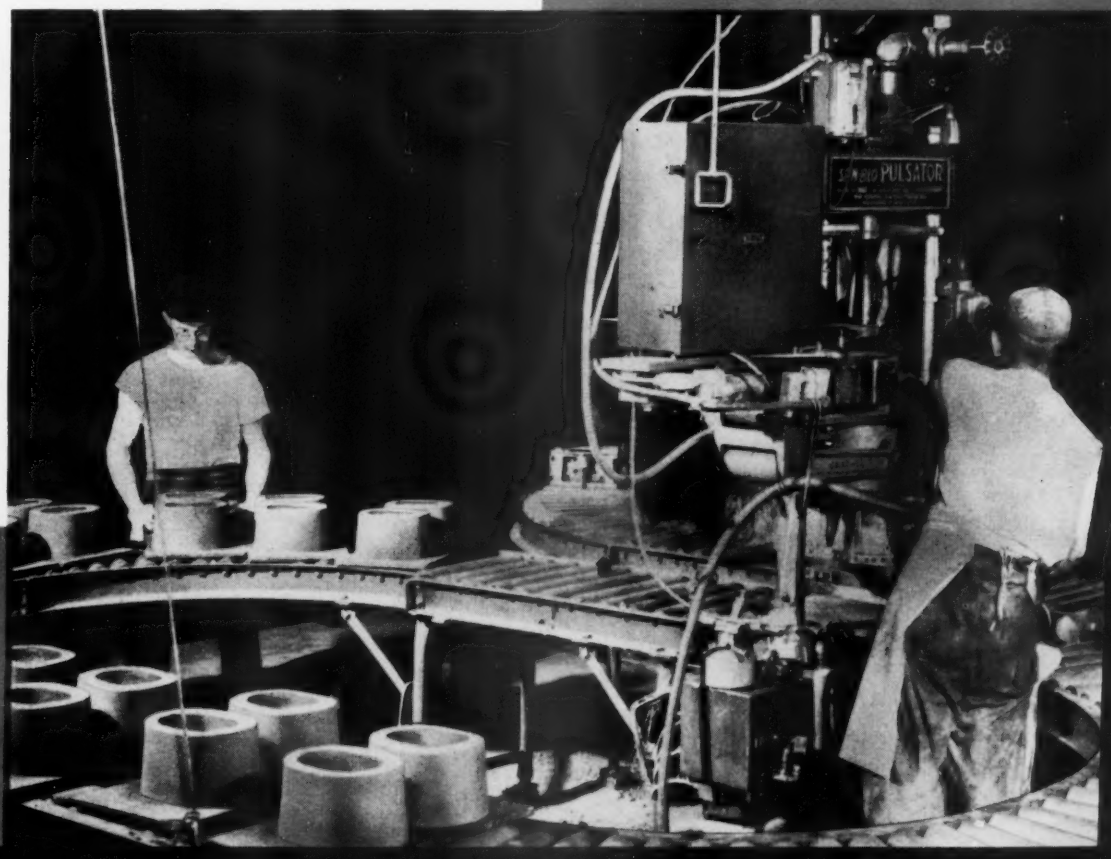
Y WITH SAN-BLO

When it comes to deciding *which* core blower to buy—you've got to look *beyond* the investment involved. You should check closely into the *advantages* and *versatility* offered by the machines you're considering and compare essentials provided as *standard equipment.*

Then, and only then, can you get a true line on *what you're going to get* for your core blowing dollars. The comparison chart on the opposite page should be very helpful to you in arriving at a decision. Answers to important core blowing questions are filled in for the SAN-BLO and space provided for other machines you may be considering. *This honest evaluation of machine merit will lead to your purchase of the* SAN-BLO!

Additional information on the SAN-BLO, for further comparison, is available on request. Or, let us know if one of our field engineers can be of assistance. Write to the SAN-BLO Division, The Federal Foundry Supply Company, 4600 East 71st Street, Cleveland 5, Ohio.

A model "250" SAN-BLO in a production foundry, blowing cores weighing up to 250 lbs. each.



A model "40" SAN-BLO in a steel foundry, blowing runner cup cores.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

Man to Man

By RALPH L. LEE

Latent Energy in the Human Atom

"Does anyone know how much energy is locked up in the human atoms which compose our foundry organizations?"

IT SURELY is exciting to think of the tremendous energy locked up in just about every substance a person can name, even the commonest. Hydrogen, for example, just about the most plentiful element there is (water being two-thirds hydrogen), packs an unbelievable wallop when it's triggered just right.

To me, the most interesting thing about all this is that hydrogen and all of its companions have had the same amount of energy cooped up in them since the beginning of creation. Nothing has changed about them, even in this atomic age, except our ignorance of what they really are, how they are put together and what makes them tick.

Does anyone really know just how much energy is locked up in the human atoms of which our foundry organizations are composed, waiting to be triggered?

* * *

I'm never alone as I work up in the Lee Hobby Foundry, all by myself. A continual parade of foundry friends I've made over the years seems to be passing by old memory's eye. This past week, for example, having made the patterns, I've been casting an altar cross and its base for a little mission near by.

As I was getting the sand heap in shape the dos and don'ts I've picked up from foundrymen who tried to keep me on the straight and narrow came to mind. Several dropouts reminded me of the teachings and cautions of others. Melting, shakeout and cleaning opened the door of memory to one after another foundryman I have learned to know with friendship and profit.

After this exceptionally long parade of visitors, it dawned upon me that I now have one whale of a collection of distinguished foundry friends, from every kind of foundry work, from the shakeout crew to top management. I am proud, of course, of being called by my first name by some of the more socially careless leaders of the industry, but my most treasured memories are of those who distinguished themselves in run-of-mine foundry work.

Down in Texas I met an old Negro melter—and I mean old—who was one of the outstanding personalities of one big foundry organization. The president introduced us; in fact, he went clear out of his way to do it, and with pride, too.

I've seen lots of snagging in my day, but one guy I'll never forget. He had made a career of grinding, became a master of it and was recognized throughout his organization as one of its most outstanding craftsmen. His president introduced us.

Down East, in the foundry of one of the largest sewing machine factories in the world, I met a man who was a master molder in every sense of the word. I don't believe a week has gone by since I met him years ago in which I haven't had occasion to remember the fine points of really top-notch molding he showed me. His superintendent introduced us and told me later that this fellow was a personage in his home town. He was an officer in the building and loan association, a leader in his church and a civic councilor of considerable weight.

Another prized specimen was a man who had made a career of maintaining the stoppers for great big, bottom-pour steel ladles. He was truly an artist and recognized as such by the entire force of one big foundry. In fact, like all virtuosos, he was handled with kid gloves by everyone in the place. His president chuckled when he told me about him after the introduction.

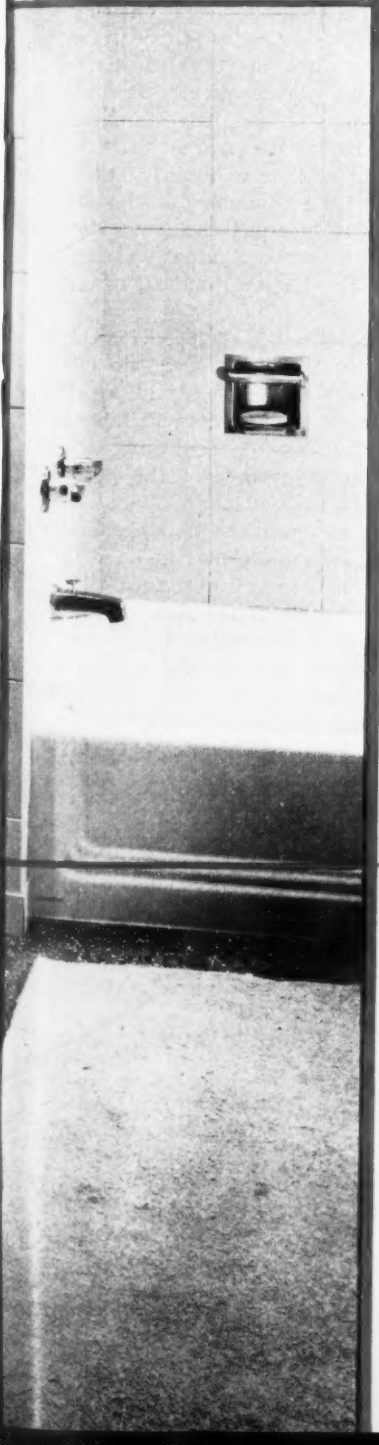
One sweeper I met, known and respected by his entire gang, took just as much pride in the cleanliness of his area as the general manager took in the performance of his organization. He turned down one promotion after another. He had found his life work and distinguished himself at it.

A watchman who didn't know foundry practice from beans took over a messy pattern storage and developed it into a work of art. The system he worked out was written up and published. He had made a contribution to the industry. I met him through his general manager.

I haven't scratched even the surface of my collection of distinguished foundrymen, but as I scan the list, I find that practically all of them built their careers in and were members of outstandingly successful foundry organizations.

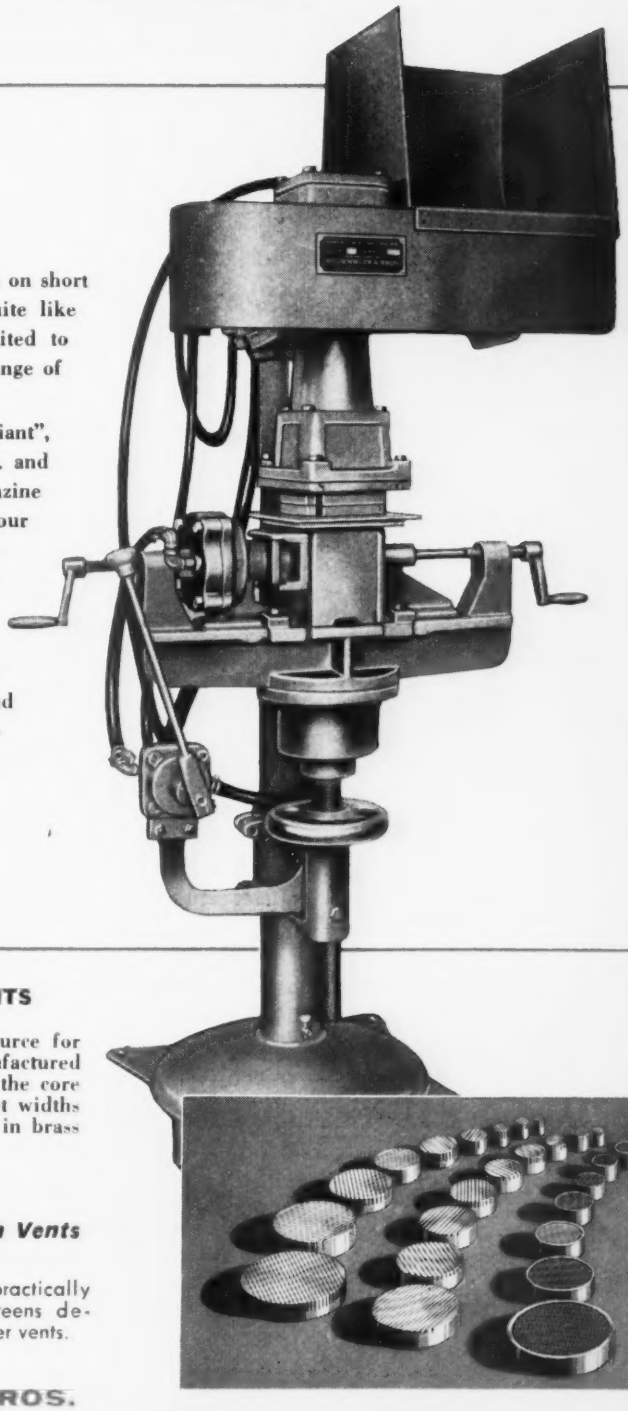
Sometimes I wonder whether we haven't skipped over the source of tremendous productive energy lying dormant in the human (hydrogen) atoms which compose our foundry organizations.

No one really knows what any individual may be capable of, even the individual himself, once he meets a challenge and lets himself go all out. Miracles galore testify to the potentiality. In fact, it's beginning to seem to me that the difference between what the individual could do if he felt like cutting loose and the



DEMMLER

The Oldest Name in Core Blowers



the DEMMLER 55

For fast, economical production on short job runs, there's no machine quite like the DEMMLER 55 — so well suited to your needs at a cost within the range of any foundry.

Accurately called "the Little Giant", the 55 handles cores up to 4 lbs. and has a wide range of sand magazine bottom openings to meet all your core box dimensional requirements. It is used for core boxes with depths up to 10".

The DEMMLER 55 has one hand-valve operating both vertical and horizontal core box clamps and blows the core in 3 seconds maximum. It's simple, rugged and requires virtually no maintenance.

PRECISION CORE BOX VENTS

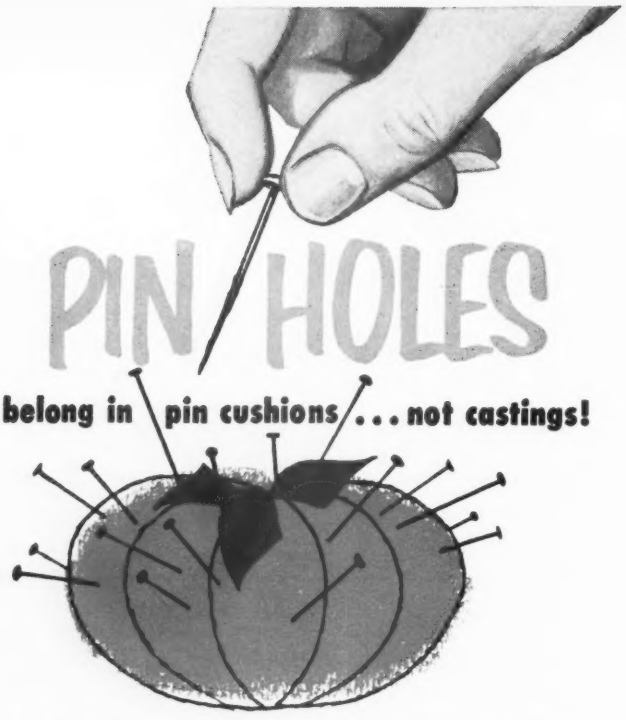
Demmler is by-far your best source for precision core box vents, manufactured by specialists who pioneered in the core blower industry. Many sizes, slot widths and screen meshes are available in brass and steel core box vents.

NEW *HL* ***150 Mesh Vents***

A new general purpose vent which practically eliminates the cleaning courser screens demand. Write for literature on Demmler vents.

WM. DEMMLER & BROS.

KEWANEE, ILLINOIS



Malleable foundry cuts pin hole porosity by 94% using GRUNDITE BOND

A prominent midwestern foundry, plagued with pin hole porosity due to sand, recently ran an extensive research on facing mixtures to determine the effect of bond on pin holes. By simply using Grundite Bond instead of their regular binder they cut pin hole porosity by 94%! No other elements were changed. Grundite Bond alone made the spectacular difference in the results!

Three facing mixtures were tested and the same pattern used throughout the test. The casting was chosen because of its peculiar affinity for pin hole porosity in regular producion. The results:

Facing Mixture	%Castings with Pin Holes
Regular Facing	100%
Facing Mixture "A"	65%
Grundite Bonded Facing	6%

Naturally they adopted Grundite Bond and found that it is ideally suited to malleable and light grey iron molding sands. It has moderate dry and hot strength which gives faster cleaner shake outs and easily reconditioned sand. Don't blame all pin hole porosity on the metal or casting design. Much of it may be due to the binder in the sand. If it is, Grundite Bond is what you need. It is easy to use, offers important improvements in sand properties together with equally important cost savings. Write today for complete details.

ILLINOIS CLAY PRODUCTS COMPANY
208 S. LaSalle Street, Chicago 4, Ill.

GRUNDITE
BOND CLAY
FOR MOLDING SANDS

least he can get by with doing is a production factor pretty much lost sight of in our forward march toward mechanization, automation and other exciting generalities.

I haven't the slightest doubt that a foundry organization composed entirely of individuals who are making a career of their individual jobs would upset all of the production standards now accepted as gospel.

A foundry can't run very long without sweepers, and it can't run at all without melters, molders, coremakers, pourers, shakeout men, grinders, chippers, sand cutters and general service laborers. Each post in a foundry must be filled before a wheel can turn.

What is the most important part of a clock? Is it the mainspring? Could it be the big gear on the spring shaft or its connecting pinion? The escapement or the hair spring on the balance wheel? It certainly couldn't be the little stamped nut that holds the frame to the frame post (a dime a dozen). And yet, if this little common nut should work loose and permit the frame to spread, the clock will stop just as surely as though the main spring had broken.

As we all know, all posts in a foundry must be filled, regardless of how easily or difficultly each position can be filled. The current labor market hasn't one darned thing to do with the importance of the post to the over-all operation.

There is no question in my mind that when each individual in an organization is recognized and dealt with on the basis of the importance of the post he holds, rather than how easily he can be replaced, the groundwork has been laid for the cultivation of career people and a good crop of distinguished foundrymen.

The clockworks concept of a foundry organization might well be the trigger for setting off a chain reaction which could result in the release of latent production energy in the human atoms which compose our foundry organizations.

Plans $1 Million Expansion

Pittsburgh Metallurgical Co., Calvert City, Ky., is undergoing a $1 million expansion program at its ferroalloy plant that will increase its production about 30 per cent. Plant structure is being extended 200 ft and two electric furnaces will be installed. One of the furnaces is reputed to be the world's largest in use in ferroalloy production.

Step ahead in this five billion dollar market with

Foundry's

PLUS 5 SERVICE

What is PLUS 5? It's your key to more business from foundries. It gives every FOUNDRY advertiser a bonus he can get from no other source. Here is help in analyzing this market—studying sales territories and potentials—planning the sales effort—and creating a constructive promotion program to the 5 billion dollar foundry market. It's time to take a new look at this market—and at the unusual selling aids we have for you. Say PLUS 5 to your FOUNDRY representative and he'll show you this 5-step program designed to move more of your products into foundries.

A Penton Publication

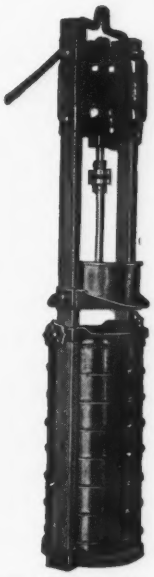
FOUNDRY

more than a magazine... a complete sales development service

Penton Building, Cleveland 13, Ohio

There's a COMBS FOUNDRY RIDDLE

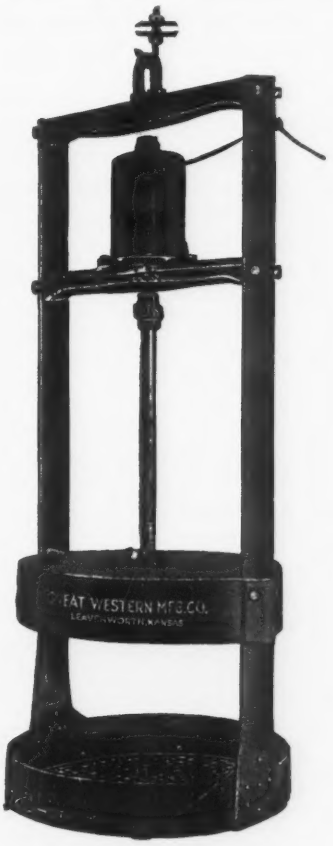
For Every Sifting... Mixing... Aerating Job!



Type "HL" Lab Sifter for sand control $250.00 without sieves

WORLD FAMOUS!

Type "CS" with 24" square screen and automatic discharge $360.00



Type "CR" with 24" sieve $350.00

TYPE "V"

With 20" sieve $275.00
Also made with 36" sieve $495.00

All these machines cost less than 1c an hour for power. Quickly removable steel rim sieves can be removed, emptied and replaced in seconds. Saves up to 97% of your labor costs. Send for free descriptive folder.

Prompt Delivery From Your Foundry Supply House

GREAT WESTERN MFG. CO.

LEAVENWORTH • KANSAS

Foundry Developments

By EDWIN BREMER
Metallurgical Editor

RECENT modification in procedure for hot-tinning cast iron, termed the direct chloride method and developed by the Tin Research Institute, eliminates use of fused chloride baths. As described in *Tin and Its Uses*, October, 1955 issue, the casting must be carefully and completely blasted with No. 70 (70-mesh) angular steel grit, degreased by the trichlorethylene vapor method, and then dipped in an aqueous flux. The flux is composed of 24 lb zinc chloride, 6 lb sodium chloride, 3 lb ammonium chloride, 2 pt hydrochloric acid, and 10 gal (100 lb) water.

All surfaces of the casting must be wetted by the flux, and delay between blasting and immersion should be the minimum. Casting then is lowered slowly into the first tinning pot, whose surface is covered by at least 1 in. of a flux containing 8 parts zinc chloride, 2 parts sodium chloride and 1 part ammonium chloride. Flux must be kept in a freely ebullient condition by frequent additions of water. Tin bath temperature should be 570 to 610°F.

With large castings, which must be lowered rather slowly into the pot, the tendency of the aqueous flux on the upper parts is to dry, leading to imperfect tinning. This must be prevented by spraying with water or the aqueous flux solution. Casting should be kept in the tin pot about 5 minutes. After removal from the first tin pot, subsequent tinning and manipulating operations are as normally practiced.

Spectrographic Standards

AVAILABILITY of six new standard stainless steel samples for spectrographic determinations just has been announced by the National Bureau of Standards, Washington 25. New stainless steel standards are certified for concentrations of six major and minor elements; Manganese, silicon, copper, nickel, chromium and molybdenum. Samples are available in rods 7/32-in. in diam and 4 in. long, and in rods ½-in. in diam and 2 in. long. In addition to the elements now certified, the standards also contain aluminum, columbium (niobium), tin, titanium, vanadium and tungsten; some of these may be certified at a later date. Compositions of the standards are given in the accompanying table.

Rapid Chemical Method

RAPID method for chemical determination of magnesium in nodular cast iron has been developed by the British Cast Iron Research Association. As described in the *Journal of Research and Development*, August, 1955, the magnesium is separated from iron, etc., by zinc oxide, and determined by titration with E.D.T.A. (ethylenediaminetetra-acetic acid). Effect of aluminum, titanium and silicon is suppressed by addition of Tiron (catechol-3:5-disulphonic acid), and the effect of iron, nickel, copper, zinc and cobalt is suppressed by addition of sodium cyanide. A determination made by use of E.T.D.A. is claimed to be completed in 2 hr.

Sulphur-slag Reaction

RATE of transfer of sulphur from iron to slag at temperatures from 2624 to 2858°F was studied and reported by Tunezo Saito and Yasuji Kawii in *Science Reports* of the Research Institutes, Tohoku university, Sendai, Japan, with the following conclusions: The rate of transfer of sulphur from metal to slag increases very rapidly with increasing basicity of slag, while that from slag to metal does not change appreciably. Also the former is more sensitive to temperature than the latter. Higher basicity and temperatures contribute to good desulphurization by basic slag. Expressing the rate of transfer of sulphur under reducing conditions as a first order reaction is inadequate though the equation of the first order reaction holds for slags of high viscosity. It seems that the side reaction (reduction of iron oxide in the slag to iron) remarkably influences the transfer of sulphur.

Composition of NBS Spectrographic Stainless Steel Standards

Sample Numbers		Mn	Si	Cu	Ni	Cr	Mo
445	845	0.77	0.55	0.065	0.28	13.30	0.92
446	846	0.53	1.20	0.19	9.10	18.37	0.43
447	847	0.23	0.37	0.19	13.26	23.73	0.059
448	848	2.10	1.25	0.16	0.52	9.10	0.33
449	849	1.62	0.68	0.21	6.62	5.48	0.15
450	850	...	0.12	0.36	24.8	2.99	...

Removes Gases

AGREEMENT recently has been concluded between National Research Corp., Cambridge, Mass., and Leybold - Hochvakuum - Anlagen Gmbh, Cologne, Germany, for U.S. rights for the Bochumer Verein steel degassing process. Molten steel is poured through a special sealing device into an ingot mold or ladle placed in a chamber maintained at a pressure less than one thousandth that of the atmosphere by a high-speed vacuum pumping system. As the stream of metal enters the vacuum chamber it is dispersed violently, and dissolved gases evolved from the metal are pumped away. This results in an ingot or a ladle of steel with greatly lowered gas content.

Traps the Dross

PLACING the runners in the drag and the gates in the cope aids in trapping a large proportion of any dross or slag which might be carried into the gating system.

Arsenic Determination

INVESTIGATION on determination of arsenic in iron and steel by photometric methods indicates that it can be accomplished in 20 to 30 minutes with arsenic reduced to molybdenum blue color. As described by Hidehiro Goto and Yachiyo Kakita in *Science Reports* of the Research Institutes, Tohoku university, Sendai, Japan, Vol. 7 No. 3, interference of phosphorus, which also develops the blue color, is eliminated by separation through addition of amyl alcohol. Separation is accomplished in 5 to 7 minutes prior to the addition of hydrazine sulphate to develop the blue coloration. It is claimed that results obtained are similar to those obtained for arsenic by iodometric determination using stannous chloride reduction.

BASIC NEWS
FOR CUPOLA OPERATORS

Basic Refractories offers field service to foundries

Cupola operators interested in adopting a basic practice can get refractory maintenance information and assistance from Basic Refractories' engineers. These men know refractory application and are familiar with cupola practice.

BASIC CUPOLA OPERATION OFFERS IMPROVED METALLURGY

The improved metallurgy possible with basic slag systems enables cupola operators to produce base irons of low sulphur content. Because of the refining nature of these slags, and the carbon pickup accompanying basic operation, it is possible to obtain good results even while using a lower cost charge. Low sulphur content is an important factor when alloying base irons. Less alloy is required to obtain desired results. This saving, together with the saving on charged materials, makes basic operation preferable in the manufacture of relatively new cast irons.

Basic linings for cupolas offer 8 advantages

Costs of basic linings are higher than acid. But these costs are offset by the following advantages:

1. **Lower sulphur content in the iron produced**
2. **Greater carbon pickup**
3. **Higher metal tap temperatures**
4. **Use of lower cost charges**
5. **Absence of bridging and clean drop**
6. **Better pouring characteristics of metal**
7. **Less scrap castings**
8. **Steel scrap can be substituted for low phosphorous pig iron without lowering the total carbon content of the iron.**

Newly developed irons widely accepted because of unique properties

Many machine parts that before could only be manufactured by forging or casting steel, can now be made with these newly developed cast irons. Properties such as abrasion, heat resistance, fatigue, impact strength, and ductility have made the new irons widely accepted by design engineers.

Other important properties are high yield strength, good machinability, hardenability and weldability. Irons possessing these properties have opened up many new fields to the foundryman.

Gundol recommended for basic cupola maintenance

Gundol, a granular basic gun refractory, is highly adaptable and widely used to maintain basic cupola furnaces in this country. Designed for gun emplacement it affords the basic cupola operator a quick, easy method of furnace repair. Gun emplacement of the refractory forms a dense, monolithic lining eliminating joints and keeping maintenance costs at a minimum.

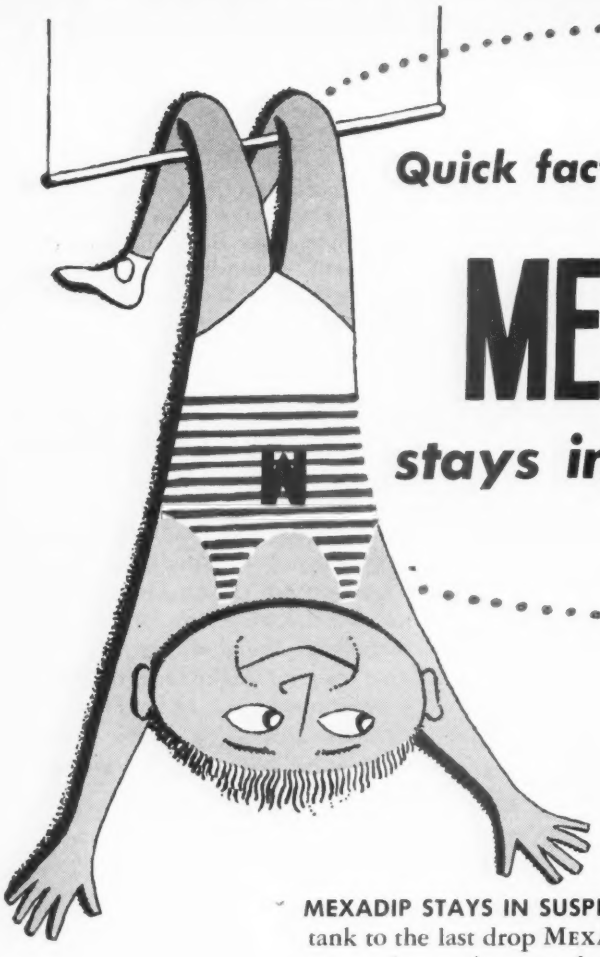
Write now for a comprehensive booklet on gunning and gun refractories.

BRI Gun, model A-20, with 20 cubic foot hopper. Nozzle and 50 feet of shooting hose included with gun. Operation also requires hoses to connect with plant water and air lines.

BASIC REFRACTORIES INCORPORATED

645 HANNA BUILDING • CLEVELAND 15, OHIO

REFRACTORIES ENGINEERING AND SUPPLIES LTD — EXCLUSIVE CANADIAN AGENTS



Quick facts for foundrymen . . .

MEXADIP®

stays in suspension!

- **MEXADIP STAYS IN SUSPENSION.** From full tank to the last drop MEXADIP stays in suspension at the same desired Baume. Let it stand over the week end, it will be ready to go Monday morning.
- **MEXADIP WILL NOT RUN, BUILD UP OR RUB OFF.** It applies equally well on either green or baked cores.
- **MEXADIP WILL NOT FERMENT.** You will not have to dump your wash because of hot humid conditions—no pock marks or pitted coating surfaces with MEXADIP.
- **MEXADIP IS DEPENDABLE AT ANY BAUME.** It is applied daily to cores for thousands of tons of castings over a range of 10-40 degrees Baume.
- **MEXADIP REQUIRES NO LONG "PASTE" MIXING.** No waiting period is necessary. Just add the powder to water and after a few minutes of stirring it is ready to go.

IMPROVE CASTING APPEARANCE AND SAVE MAN HOURS IN THE CLEANING ROOM. If you have a problem with core wash, MEXADIP will solve it. Ask us to arrange a test today.

Write for free illustrated Engineering Bulletin No. 17 giving detailed information about the complete line of Core and Mold Washes, made by The United States Graphite Company.

MEXADIP®

213

THE UNITED STATES GRAPHITE COMPANY

DIVISION OF THE WICKES CORPORATION • SAGINAW, MICHIGAN

Industry BRIEFS

WESTERN FOUNDRY CO., Tyler, Tex., is constructing a brass foundry covering an area of 30,000 sq ft that will employ 150 workers making a complete line of standard plumbing brass goods and fixtures for bath, kitchen and laundry. The line was purchased by Western Foundry Co. from the Barnes Mfg. Co., Mansfield, O. The purchase included all the patterns and pertinent production equipment.

Whiting Corp., Harvey, Ill., has formed a new export division, Whiting International, which will be devoted entirely to export business and overseas licensing. Its offices are located at 30 Church St., New York 7. Whiting already has a separate organization, Whiting Corp. (Canada) Ltd., with plant and offices in Toronto, which serves Canada.

Fuller Co., Catasauqua, Pa., has acquired all outstanding stock of Sutorbilt Corp., Los Angeles. Sutorbilt, a manufacturer of positive pressure blowers, pneumatic conveyors, fans and other products, operates two manufacturing plants in Los Angeles. It will continue to operate as a separate company.

Aloam Industries Inc., a foundry, 320 Ave. U., Brooklyn, N. Y., has been incorporated, listing capital stock of 200 shares, no par value. Directors are Albert J. Gennarelli, 174 Ave. U., Thomas M. Cmilieri, 2258 West First St., and Albert M. DiFronzo, 320 Ave. U., all of Brooklyn.

Plaster Process Casting Co., Cleveland, producer of pressure-cast matchplates, has moved from 6924 Carnegie Ave. to a new plant at 1659 Fall Ave. The one-story, concrete block building contains 5500 sq ft of floor space and has been outfitted with both new and modernized equipment.

Kaiser Aluminum & Chemical Corp. has awarded contracts for construction of a $4-million facility to produce basic refractory brick at Columbiana, O. The 130,000 sq ft main building is scheduled for operation early this summer.

Square D Co., Detroit, and Electric Controller & Mfg. Co., Cleveland, began operations on Jan. 4 as a merged corporation. Square D, the surviving company, will operate Electric Controller as a separate division. F. W. Magin, chief operating officer of Square D, had become chairman of the board of directors, and A. G. Patterson, who was president of Electric Controller, has been named president of Square D.

Foundry Promotes Safety

Truck drivers in Central East Texas were pleasantly surprised recently when inspectors of the state's license and weight division passed out good cigars to them, courtesy of Lufkin Foundry & Machine Co., Lufkin, Tex. In the interests of safe driving, the foundry contributed 2000 cigars with safety slogans imprinted on them.

American Radiator & Standard Sanitary Corp., Buffalo, has dissolved its former subsidiary, Kewanee-Ross Corp., and has formed Ross Heat Exchanger Division with headquarters in Buffalo. Kewanee Boiler Division, Kewanee, Ill., also has been formed to conduct the steel boiler activities of the dissolved subsidiary.

Republic Steel Corp., Cleveland, has appointed Bode-Finn Co., 2650 Spring Grove Ave., Cincinnati, and Cass Industries Inc., 308 Stephenson Bldg., Cass Avenue at West Grand Boulevard, Detroit 2, to handle sales and distribution of its materials handling equipment.

H. K. Porter Co., Pittsburgh, has acquired the business of Henry Disston & Sons Inc., Philadelphia, for $6 million of its new preferred stock. Porter also has acquired Carlson & Sullivan Inc., Monrovia, Calif., which will operate as a part of the Henry Disston Division, H. K. Porter Co.

Acme Resin Corp., producer of resin-coated sand utilizing liquid resin, is expanding its plant capacity and distributor organization. A new $100,000 plant for coating sand by the hot process will be located in the Chicago area close to a local sand supply. It will have a monthly capacity of about 400 tons of resin-coated sand. Newly appointed distributors stocking coated sand and shell molding resins and territories served are: Foundry Supply Co., 7600 Highway 7, Minneapolis 16—Iowa, Nebraska, Minnesota; Midvale Mining & Mfg. Co., 5015 Manchester Ave., St. Louis 10—Oklahoma, Kansas, southern Illinois, Missouri; Schuler Equipment Co., 429-433 Brown-Marx Bldg., Birmingham — Georgia, Tennessee, Alabama; Malcolm G. Stevens, 78 Summers St., Arlington, Mass.—New England; Wolverine Foundry Supply Co., 3211 Bellevue Ave., Detroit 7—Michigan.

Clark Controller Co., Cleveland, has appointed Bruce Electric Co., 1135 Butler Ave., New Castle, Pa., to distribute its complete line of pushbuttons, relays, contactors, starters and related industrial electric control equipment.

Driver-Harris Co., Harrison, N. J., has moved its Chicago branch office and stockroom to 5245 West Diversey Ave., Chicago 39. Driver-Harris makes electrical resistance, electronic and heat-resistant nickel-chrome alloy castings.

Lennox Furnace Co. is negotiating the sale of the Genesee Foundry Co., 400 North Midler Ave., Syracuse, N. Y. Lennox Co. needs the space occupied by the foundry for improvement of production, warehousing and shipping facilities.

Johnston & Jennings Foundry Corp., 3320 South Artesian St., Chicago 8, a division of Conlon-Moore Corp., Cicero, Ill., was hit by fire on Dec. 22. Damage from the blaze was estimated at $200,000.

Abco Mold & White Metal Casting Co., 334 North Harding, Chicago, suffered damage estimated at $90,000 in a fire on Jan. 5. Caused by an explosion, the fire destroyed the building.

Metallurgical Associates Inc., 30 Rockefeller Plaza, New York, plans to expand its activities beyond the area it now serves—New England, the middle Atlantic states and the South. Formed two years ago, it offers metallurgical and engineering consulting service in all phases of

SPEEDS CLEANING, INCREASES PLANT CAPACITY, CUTS LABOR NEEDS FOR LARGE AUTOMOTIVE FOUNDRY

The goal of automation — maximum production without manual handling — has been achieved in the cleaning department of a large Detroit automotive foundry through use of a 48″ Continuous Tumblast.

Processing of castings through this equipment is so automatic that the foundry process engineer reports, "We regard the Continuous Wheelabrator Tumblast as a part of our materials handling system — a conveyor integrated into our production line."

Gray iron castings cleaned in this automatic machine include transmission housings, cylinder heads, intake and exhaust manifolds, water pumps, bearing caps and differential cores. They come from the molding lines on a belt conveyor . . . are fed into the Tumblast **automatically**, are cleaned **automatically** and discharged **automatically** to sorting tables.

This has eliminated sorting and toting these castings to batch type machines, loading and unloading for cleaning, and toting in batches to sorting areas.

Cleaning an average of 8 to 10 tons of castings hourly, the Tumblast adds considerably to cleaning capacity of the plant and drastically reduces overall cleaning costs.

Write today for literature to learn how continuous blast cleaning can cut your production costs.

WHEELABRATOR
CORPORATION
(Formerly American Wheelabrator & Equipment Corp.)

505 S. Byrkit St., Mishawaka, Indiana

World's Largest Builders of Airless Blast Equipment

foundry work, in addition to plant layout and organizational planning, industrial engineering, and research and development work for clients. W. C. Rickerson is president, Spencer Harris is vice president and Howard F. Taylor, John Wulff and Carl F. Floe are associates. On occasions the company also makes use of technical and practical specialists throughout America and abroad to supplement the skills of those within the group.

Advance Aluminum & Brass Foundry Inc., has been formed in Sheboygan, Wis., with an authorized capital stock of 150 shares of common with par value of $100 per share. Incorporation papers were signed by Steve, Mary and Adam Andracek. Steve Andracek is the registered agent at 1622 Ontario Ave., Sheboygan.

Weldaloy Products Co. has moved from its East Detroit, Mich., location to newly built facilities at 11551 Stephens Drive, Van Dyke, Mich., a Detroit suburb. New facilities include a foundry, a metallurgical laboratory and general offices.

Frank G. Hough Co., Libertyville, Ill., has appointed the following new distributors: Phillippi Equipment Co., with headquarters in Minneapolis and branches in Duluth, Hibbing and Moorehead, Minn., serves all Minnesota; Rish Equipment Co., with plants in Cleveland, Columbus, Dayton, Toledo, Cincinnati and Portsmouth, O., serves Ohio; J. D. Evans Equipment Co., with headquarters in Sioux Falls and a branch in Rapid City, S. Dak., serves all of South Dakota; Brandeis Machinery & Supply Corp. is serving added territory in southern Illinois from its new plant in Mt. Vernon, Ill.; State Equipment Co., Montpelier, Vt., serving the entire state of Vermont; and Orton Equipment Co. is the distributor at Stratford, Calif.

Thor Power Tool Co. has acquired the Cincinnati Rubber Mfg. Co., Cincinnati, manufacturer of conveyor and transmission belting, hose, rubber covered rolls and a wide range of molded and associated industrial rubber products. The new subsidiary will operate as the Cincinnati Rubber Division.

Lester Castings Inc., Bedford Heights, O., is expanding its productive capacity by adding 10,000 sq ft to its physical plant, installing several new die casting machines and replacing tool room machine tools with new multipurpose units.

Archer - Daniels - Midland Co. has moved its Chicago sales office from 927 Blackhawk St. to 4761 West Touhy Ave., Chicago 30. New telephone numbers are Orchard 4-9100 and Irving 8-6590.

Palmer-Bee Co. has moved into new general offices on Opdyke Rd. and Grand Trunk Railroad, Bloomfield Hills, Mich. Local sales office will be retained on West Grand Blvd., Detroit, and manufacturing will continue on Poland Ave., Hamtramck, Mich.

United Engineering & Foundry Co., Pittsburgh, tentatively has purchased the government's idle foundry at New Castle, Lawrence Co., Pa., for $7,750,000. Final sale of the defunct Defense Plant Corp. property is subject to approval of Congress.

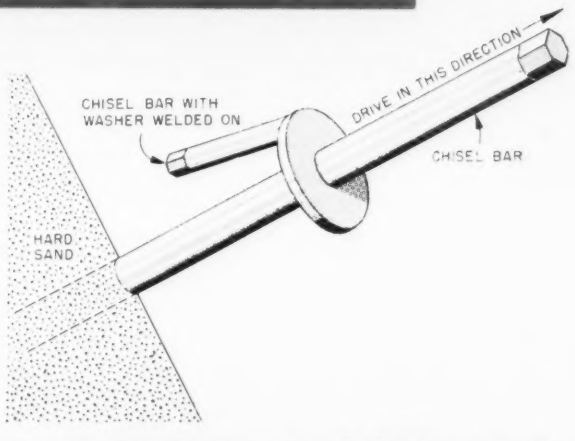
Hyster Sales & Service Inc., is the new name of Hyster Co. of Louisiana Inc., 327 North Diamond St., New Orleans, La. William C. Harmon Jr., formerly in the order department at the Hyster factory, Danville, Ill., has joined the dealer as a salesman.

Slack-Horner Brass Mfg. Co., moved recently from Denver to Longmont, Colo., and has started production of copper, aluminum, lead, zinc and other nonferrous alloy castings.

Artra Aluminum Foundry & Mfg. Co., 16 East Madison St., St. Charles, Mo., is adding 5000 sq ft of floor space to its plant.

Simplex Foundry Co., 681 Michigan Ave., Columbus, O., suffered $33,000 damage by fire on Dec. 13.

HOW TO DO IT



Easily Made Device Aids Removal Of Chisel Bars from Hard Sand

LONG CHISEL BARS often become jammed in the hard sand in deep holes and grooves of castings during the cleaning process. The practice of many workers is to use an air hammer and hard chisel to cut a notch in the shank of the bar and drive it back out of the sand. As a consequence, the long chisels soon break at the cut and can not be reused until a new head is machined on them. Then the chisel might be too short for deep holes.

One way to solve the problem is to drill a 1 1/16-in. hole in a common pressed 3/8 x 2-in. washer and weld it onto a discarded chisel which still has a good machined head on it. The washer portion of the device is slipped over the shank of the jammed bar and the chisel end is inserted into the air hammer. By holding the air hammer at a slight angle, the washer binds against the jammed bar, permitting its removal from the packed sand without damage.

The method has been used successfully on chisel bars up to 12-ft long. For shorter and smaller diameter bars, smaller washers can be used on the removal device.

Do you have any trick of the trade tucked away with your foundry experience? Why not release them to fellow foundrymen? FOUNDRY will pay a minimum of $15 for each idea submitted and published. Send a photo or drawing with your idea

NEWS VIEWS

Photo by Muskegon *Chronicle*

PRECISION CASTING: The semiannual meeting of the Government Precision Casting Committee, held Nov. 17-18 in Muskegon and Whitehall, Mich., was attended by 16 members of government shipbuilding and ordnance sections. The first day of the meeting was conducted by Misco Precision Casting Co. and included a plant tour and technical sessions on process control and metal specifications. Committee members devoted the second day to a business session. In the illustration, K. J. Yonker and C. W. Schwartz, Misco Precision Casting Co., at the end of the table, are discussing some of the problems pertinent to production of castings

GIANT PATTERNS: Two thousand feet of mahogany and 500 ft of pine were used to make this 1500-lb pattern and another like it for the Construction Machinery Division, Clark Equipment Co. Patternmaker Norman Anderson, Warren E. Allerton Pattern Works Inc., Benton Harbor, Mich., appears with the pattern, which will be used to make a steel casting for the circle gear on truck-excavator cranes. The upper works of the truck rotate on this gear

Photo by Fred Ridenour, Whiting Corp.

FEF REGISTRANTS: Present at the Nov. 7 meeting of the Chicago Chapter of the AFS to see presentation of the second Robert E. Kennedy scholarship was this large group of Foundry Educational Foundation registrants from the Navy Pier Branch of the University of Illinois. Dean F. W. Tresize is fifth from left, front, and Prof. R. W. Schroeder sixth from right

dag
DISPERSIONS®

OBERDORFER FOUNDRIES, INC. uses 'dag' dispersions in more than 15 operations

To speed the production of non-ferrous castings for jet engine frames and other complex parts, Oberdorfer Foundries, Inc., Syracuse, New York, uses **'dag'** Colloidal Graphite in many ways. For example:

... As a coating for cast iron and steel chills, the refractory *dry lubricating film* prevents aluminum from fusing to the chills.

... As an ingot-mold wash, a **'dag'** dispersion notably increases mold life and greatly improves surface qualities of the castings.

... As a chilling agent, **'dag'** Colloidal Graphite hastens solidification of heavy sections in permanent-mold castings.

Oberdorfer relies on **'dag'** Colloidal Graphite because it is highly refractory and will tolerate any temperature met in the foundry. Coatings of **'dag'** dispersions do not adsorb harmful gases, are chemically inert, promote rapid heat transfer and chilling, and help to maintain the high quality production for which Oberdorfer is famous.

To learn how this versatile material can help you produce finer castings, write for our free booklets on general applications of **'dag'** dispersions in the foundry and **'dag'** Colloidal Graphite used as a parting compound. Write for Bulletins No. 425-Y11 and No. 427-Y11.

Dispersions of molybdenum disulfide are available in various carriers. We are also equipped to do custom dispersing of solids in a wide variety of carriers.

ACHESON COLLOIDS COMPANY
PORT HURON, MICHIGAN
... also ACHESON COLLOIDS LIMITED, LONDON, ENGLAND

use 'dag' dry films for trouble-free lubrication

LIMITS OF ACHESON INDUSTRIES

New Equipment and Supplies

Time-Energy Analyzer: Stewart Instrument Co., 6507 Grand River Ave., Detroit 8, Mich.—This portable instrument determines the operating efficiency of electric-motor-driven machines, including grinders, by measuring the productive time and energy involved. It integrates the elements necessary to determine such factors as: Machine utilization; best cutting tool; oil and coolant, cutting tool life standards; machinability index; horsepower at tool necessary to remove 1 cu in. of metal per min; tangential cutting force in pounds at the tool; cutting tool efficiency index; rate of doing work

and work standards. Instrument is adaptable to 220 or 440 v, 3-phase, 60 cycle current for driving motors 1 to 30 hp at 220 v, 2 to 60 hp at 440 v. Instrument is automatic and requires no gadgets to make it operable, according to the manufacturer.

For More Details Circle No. 1—Page 171

Protective Curtains: Eastern Equipment Co., Willow Grove, Pa.—Flame-resistant curtains and blankets are made from impregnated canvas and are designed to provide protection from intense heat, arc flash, molten splash, flying chips and scale. Each order is individually processed in 8, 10 or 12 oz duck in sizes up to and over 100 sq ft.

For More Details Circle No. 2—Page 171

Coreblower: Beardsley & Piper, Division Pettibone Mulliken Corp., 2424 North Cicero Ave., Chicago 39, Ill.—Coreblower is designed to bring

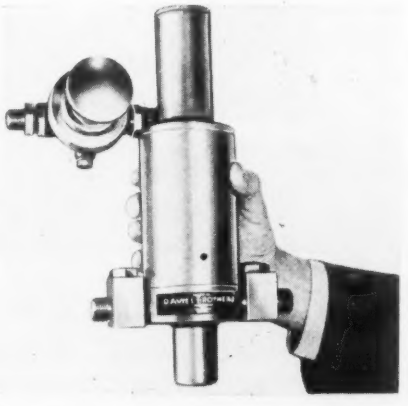
all of the automatic features of big high-speed automatic equipment to the small shop. Coreblower is push-button controlled with all operations automatically sequenced. Unit will handle all types of coreboxes—open-face, horizontally split or vertically split. A removable table clamp is available for horizontally split boxes and a 2-in. draw cylinder handles horizontally split boxes where the upper half is mounted on the blower magazine.

For More Details Circle No. 3—Page 171

Portable Dust System: Craftools Inc., 401 Broadway, New York 13, N. Y.—Portable dust collecting and shop cleaning system uses any standard garbage or ash can as its waste receptacle. Powered by a 1/3-hp ball bearing ac motor, the unit has an 8 in. pressure blower system for picking up sawdust, wood chips, dust, dirt or metal shavings at their source. Manufacturer reports the machine is suited for attachment to grinders, metal surfacers, belt grinders, sanders, band saws, lathes or other similar equipment.

For More Details Circle No. 4—Page 171

Air Pump: Davies Bros., 120 Wall St., New York 5, N. Y.—Air pump gives pressures up to 10,000 psi from air lines of 100 psi, works automatically, weighs 16¼ lb and measures 3¼ x 12 in. When used as a hydraulic power source, the pump is suitable for operating small presses, jacks, rams, clamping devices and other hydraulic mechanisms. On a closed circuit, the pump reportedly



will maintain pressure for an indefinite period without consuming any air.

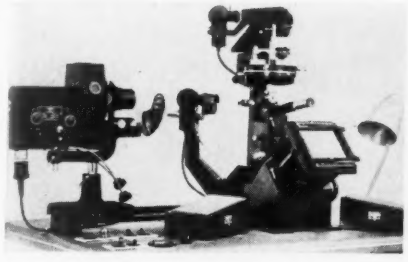
For More Details Circle No. 5—Page 171

Conductors: Cleveland Crane & Engineering Co., Wickliffe, O.—Aluminum conductors with sliding shoe collectors are to handle heavy current requirements of overhead traveling cranes. Conductors are available in 300, 500, 1000 and larger ampere sizes. They may be either side or overhead mounted to crane girders or runways by hangers made to permit the conductors to float.

For More Details Circle No. 6—Page 171

Metallograph: Wm. J. Hacker & Co., 82 Beaver St., New York 5, N. Y.—Austrian-made metallograph provides magnifications from 32 to 2200X microscopically and from 4 to 25X macroscopically. It permits all known methods of investigations in-

For More Details on These Items
Use Reply Card—Page 171



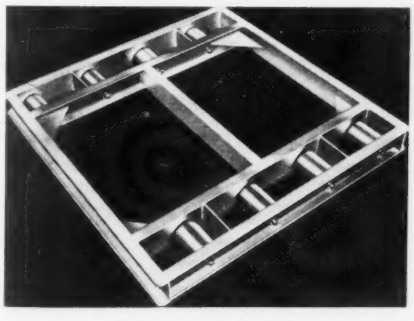
cluding bright and dark field, polarized light, phase contrast, interference testing, microhardness and grain size measuring. Five alternate light sources, including a zirconium arc, are available.

For More Details Circle No. 7—Page 171

Electric Oven: Grieve - Hendry Co., 1401 West Carroll Ave., Chicago 7, Ill.—Portable electric oven has varied industrial applications including preheating of molds. Ovens are constructed so one can nest on top of another for use in groups or operated as individual ovens. Construction is heavy gage steel. Asbestos air cell insulation is provided. Inside dimensions are 28½ in. wide x 24 in. deep x 20½ in. high. Shelves are removable to permit use of entire height. Models with four shelves, eight drawers and variety of temperature ranges can be supplied.

For More Details Circle No. 8—Page 171

Pallet Dollies: Magline Inc., 1900 Mercer St., Pinconning, Mich. —Pallet dollies in six standard sizes



with capacities of 2000 or 4000 lb are made of welded magnesium channels and 3½-in.-diam rollers equipped with ball bearings and steel axles. Roller spacing may be even or staggered. Units are designed to provide maximum strength for minimum weight to aid one-man materials handling. Special sizes can be supplied.

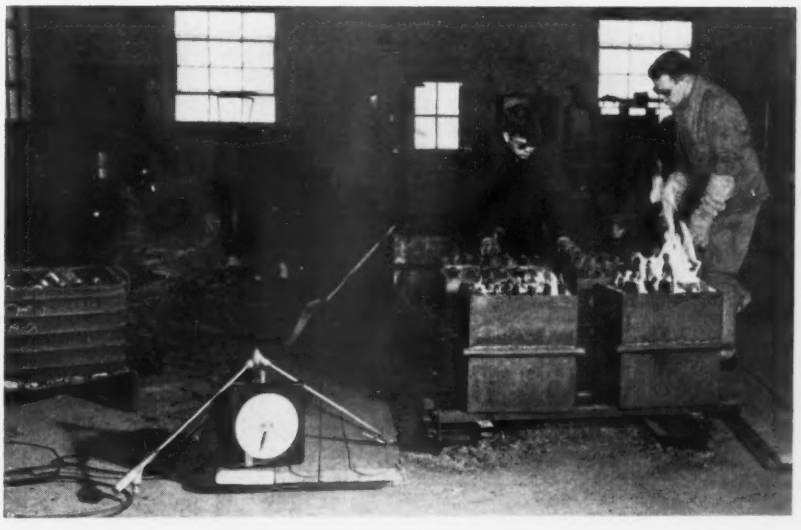
For More Details Circle No. 9—Page 171

Braking Controllers: Electric Controller & Mfg. Co., 2700 East 79th St., Cleveland, O.—Dynamic braking controllers are said to practically eliminate brake lining wear on overhead cranes. Controllers provide electrical braking by separately exciting the series field of the drive motor from the power source to positively decelerate the crane. Braking is applied by a limit switch located beneath the regular foot brake pedal. Slight depression of brake pedal closes limit switch, applies dynamic braking, thus absorbing crane's initial momentum. Additional pressure actuates standard foot brake to bring crane to stop.

For More Details Circle No. 10—Page 171

L-P Power Sweepers: Wilshire Power Sweeper Co., 227 Dundee Ave., Elgin, Ill.—Liquefied petroleum gas equipment is available for installation on company's power sweepers. Gas tank sizes are standardized;

Thermocouple Offers Portability and Accuracy



COMPACT, PORTABLE molten metal thermocouple is said to combine portability with the accuracy and high precision of the electronic null-balancing method of measurement. Indicator weighs 30 lb and can be taken anywhere that 120-v, 60-cycle current is available.

Pointer indicates measured temperature on a circular scale 23 in. in calibrated circumference. Balancing time for the indicator—time required for full travel of the pointer from one end of the scale to the other—is five seconds, enough to match the speed of the thermocouple which normally reaches metal temperature in 8 to 12 seconds.

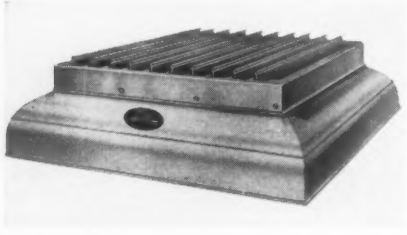
Thermocouple normally requires only the periodic replacement of a quartz tip protecting the measuring junction of the couple. According to the manufacturer, the unit has application wherever an accurate check of molten metal temperature is required as in cupola troughs, transfer ladles, shank ladles, runner boxes, risers or in small laboratory furnaces. The couple and indicator are manufactured by Leeds & Northrup Co., 4907 Stenton Ave., Philadelphia 44, Pa.

For More Details Circle No. 11—Page 171

Sweepers in various sizes and capacities for use in many industrial applications can be supplied.

For More Details Circle No. 12—Page 171

Roof Exhausters: Iron Lung Ventilator Co., 5403 Prospect Ave., Cleveland 3, O.—Roof exhausters are



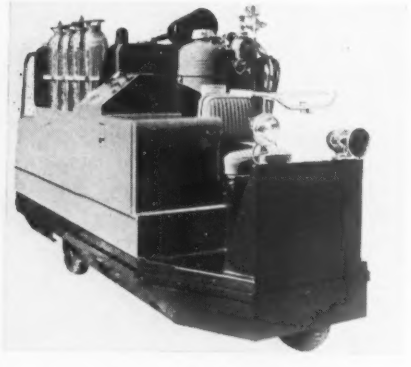
made of heavy wall, extruded aluminum sections with all joints welded. All-aluminum construction makes the units impervious to rust and corrosion and eliminates painting. Capacities from 3800 to 42,000 cfm are available in 20, 24, 30, 36, 42, 48 and 60 in. sizes. Exhausters are claimed to be leakproof, with dampers open or closed, even during severe storms.

For More Details Circle No. 13—Page 171

Grinding Wheel: Electro Refractories & Abrasives Corp., 344 Delaware Ave., Buffalo 2, N. Y.—Heavy-duty grinding wheel is for use in swing frame grinding of steel castings. Wheel is a modified version of one designed recently for cleaning stainless steel billets. Modified wheel is said to act softer but cut faster than conventional models. It is being made in sizes ranging from 16 to 24 in. in diam and from 1½ to 3 in. thick.

For More Details Circle No. 14—Page 171

Fire Truck: Seco Engineering & Mfg. Division, Seco Safety Products Co., 1300 West Fort St., Detroit 26,



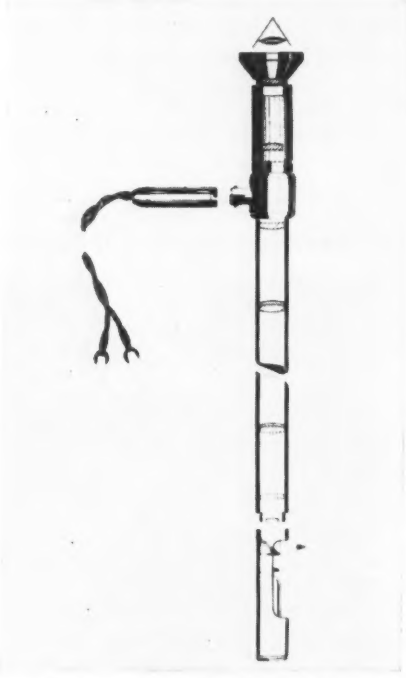
Mich.—In-plant fire truck features four guns carrying CO_2, dry chemicals, water and foam. Truck has speeds of 15 mph. Turning radius is 96 in. A 15 cu ft accessory cabinet is included as well as a ladder cabinet for an extension ladder. Machine is 50 in. wide and 68 in. high. Hoses are 100 ft as standard equipment.

For More Details Circle No. 15—Page 171

Solenoid Air Valve: Mechanical Air Controls Inc., 10030 Capital, Oak Park, Detroit 37, Mich.—A three-position, four-way double solenoid air valve features a neutral position and is supplied with either open or closed centers. Both models are available in ⅜ in. I. P. S. Side porting is standard. Bottom ports are provided by request.

For More Details Circle No. 16—Page 171

Inspection Tube: Homestrand Inc., Larchmont, N. Y.—Precision-built inspection tube for all types of "blind" inspection is equipped with



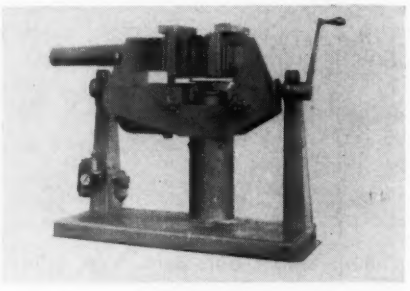
self-contained lighting and lenses that transmit a bright image from point of examination to the eyepiece for direct examination or to a camera for photographic recording. Unit can be supplied with various hinged and fixed devices for bottom, rearward, forward and angular viewing. Diameters are as small as $\frac{3}{16}$-in. and lengths up to 23 ft.

For More Details Circle No. 17—Page 171

Industrial Fans: American Blower Corp., Detroit 32, Mich.—Line of industrial fans provides capacities for a full range of industrial requirements and features a packaged fan complete with motor, V-belt drive and running gear enclosure for volumes to 23,000 cfm at static pressures to 10 in. Wheel diameters to 45⅛ in. and inlet diameters to 26 in. are available in the "packaged" units.

For More Details Circle No. 18—Page 171

Shell Coreblower: Shallway Corp., 1000 South Fourth St., Connellsville, Pa.—Bench model shell coreblower is designed to produce cores in either job lots or production quantities from coreboxes up to 6 in. across the parting line by 12 in.



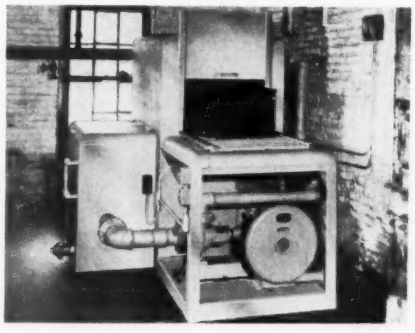
wide by 10 in. high. Coreboxes of all smaller sizes can be accommodated. Coreboxes designed for side blowing must be redesigned to blow into the parting line for use on the machine. If screen vents are in the boxes, it is not necessary to remove them.

For More Details Circle No. 19—Page 171

Plaster Release: Dri-flo Mfg. Co., 410 East Fifth St., Royal Oak, Mich.—Plaster release requires no thinning and when brushed or sprayed on wood, metal or other plaster eliminates plaster burn and rust formation on models. Drying is immediate on plaster, 20 minutes when applied to wood or metal. Release can be used as an agent in taking plasters from plasters, with no other material or release needed. It reportedly dries on wax and can be used as an adhesive for wax to wood or wax to plaster to achieve metal thickness.

For More Details Circle No. 20—Page 171

Spray Washer: Waukee Engineering Co., 407 East Michigan St., Milwaukee 2, Wis.—Spray type wash-



ing machine is designed for heat treating department use and made in standard sizes to fit the popular 24 x 36 x 15 in. carbo-nitriding furnace trays. Other sizes also are available. All have optional door openings of 20, 22 and 24 in. high. Unit

IDEAS FOR FOUNDRYMEN

HERE ARE QUICK REVIEWS OF NEW LITERATURE—available to foundrymen as "idea" and reference information. Readers in the United States and Canada may obtain copies by using the attached cards. Readers in foreign countries should write direct to the manufacturer offering literature.

81. Blast Cleaning Machine

Wheelabrator Corp., 505 South Byrkit St., Mishawaka, Ind.—Table type airless blast cleaning machines of 6, 8, 10 or 12 ft diam are described in bulletin 100-D. Installation views, engineering drawings and mechanical and electrical specifications are included for all the different sized machines.

82. Gamma Ray Projectors

Metal & Thermit Corp., 100 East 42nd St., New York 17, N. Y.—Bulletin P-196 explains how the portability, safety, versatility and economy of gamma ray equipment expands radiographic applications as a practical, economical tool for nondestructive testing.

83. Portable Air Tools

Rotor Tool Co., 26300 Lakeland Blvd., Cleveland 32, O.—Bulletin 53 illustrates and gives specifications for portable, air-driven screwdrivers, nutsetters, impact wrenches, drills, wheel grinders, straight grinders, vertical grinders, scalers, chippers and rammers.

84. Die Casting Machines

Lester-Phoenix Inc., 2711 Church Ave., Cleveland, O. — Illustrated brochure details features and technical advantages of line of die casting machines. Charts indicate basic capacities for both zinc and aluminum machines. Typical parts which can be cast are described.

85. Carbon Source

United States Graphite Co., Saginaw, Mich.—Methods of using a carbon source for furnace charge or ladle recarburization are detailed in engineering bulletin 11.

86. Testing Machines

Baldwin - Lima - Hamilton Corp., Testing Equipment Department, Philadelphia 42, Pa.—Universal testing machines with capacities from 10,000 to 5 million lb are described in bulletin 4401. Standard and special types of vertical and horizontal machines are included.

87. Air Line Respirators

Mine Safety Appliances Co., 201 North Braddock Ave., Pittsburgh 8, Pa.—Bulletin 1009-8 illustrates and describes three air line respirators designed for protection in atmospheres not immediately harmful to life such as toxic dusts, welding and cutting fumes and fumes from molten metals.

88. Conversion Tables

International Nickel Co., 67 Wall St., New York 5, N. Y.—Hardness conversion tables for steels are offered on pocket-size celluloid card. Approximate relationship between brinell, DPH (Vickers), Rockwell and Shore Scleroscope hardness values and corresponding tensile strengths of steels is given.

89. Refractories

Plibrico Co., 1800 Kingsbury St., Chicago 14, Ill.—Catalog 69 covers range of refractory products for industrial, foundry and steel mill furnaces. In addition to descriptions and illustrations of typical installations, a material application chart is included.

90. Lifting Magnets

Stearns Magnetic Co., 635 South 28th St., Milwaukee 46, Wis.—Selection information, size and operating data, specifications and dimensions on line of lifting magnets are offered in bulletin 35-C.

91. Indicating Pyrometers

Barber-Colman Co., Wheelco Instruments Division, Rockford, Ill.—Two styles of indicating pyrometers in ranges up to 3600° F are described in bulletin F 6048-1.

92. Rolling Bearings

Dodge Mfg. Corp., Mishawaka, Ind. —Application photos, engineering drawings, dimensions, load ratings,

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list prices on line of ball and roller bearings, pillow blocks and flange cartridge mounts, hanger bearings and take-ups are contained in bulletin A-638.

93. Abrasive Separators

Pangborn Corp., 1400 Pangborn Blvd., Hagerstown, Md.—Importance of proper blast cleaning abrasive separation to efficient cleaning room operations is emphasized in bulletin 1003. Four separators are described and their principles of operation illustrated.

94. Conveyor Systems

Standard Conveyor Co., North St. Paul 9, Minn.—Bulletins 68 and 85 provide illustrations and general information on enginered power and gravity conveyor systems that are designed to move foundry tonnage rapidly with a minimum of maintenance.

95. Fork Trucks

Baker-Raulang Co., 1223 West 80th St., Cleveland 2, O.—Performance specifications, dimensions, details on controls and construction with explanations of features and attachments for use on electric fork trucks are offered in bulletins 1324-C and 1325-D.

96. Pyrometer Accessories

West Instrument Corp., Engineering Specialties, 7706 Shawnee Run Rd., Madeira, O.—Selection data, application charts and suggested materials for specific uses for pyrometers and accessories are contained in catalog.

97. Sand Preparation

National Engineering Co., 549 West Washington Blvd., Chicago 6, Ill.—Condensed specifications and general operational information on several sand mullers are offered in bulletin 489. Several pieces of auxiliary equipment also are shown.

98. Drive Maintenance

Reliance Electric & Engineering Co., 1088 Ivanhoe Rd., Cleveland 10, O.—Bulletin, "How to Care for Jr.," describes and illustrates a comprehensive program available to keep electronic variable speed drives operating at peak efficiency.

99. Nuts and Bolts

Caterpillar Tractor Co., Peoria, Ill. —"Let's Talk Nuts and Bolts" discusses differences in nuts and bolts caused by variations in quality of material, type of heat treatment received and type of inspection provided before use.

100. Layout Fluid

Dayton Rogers Mfg. Co., 2824 13th Ave. South, Minneapolis 7, Minn.—Folder presents general descriptive and ordering information on layout fluid for use by tool, die and model makers and metal pattern makers and for identification of bar stock, sheet or strips.

101. Metal Control

Herbert A. Reece & Associates, 960 Union Commerce Bldg., Cleveland 14, O.—Booklet dicusses brinell hardness as a measure of precise control exercised in manufacture of a casting and elaborates upon a licensed casting method to promote uniformity of mechanical properties, machinability and solidity.

102. Electric Motors

Louis Allis Co., Milwaukee 7, Wis.—Descriptions, photographs, explanatory technical drawings and graphs provide data on performance and application features of enclosed, explosion-proof electric motors manufactured to new NEMA standards.

103. Muffle Furnace

Hevi Duty Electric Co., 4212 Highland Ave., Milwaukee 1, Wis.—Bulletin 1055 provides general information and specifications on an automatically controlled muffle furnace for continuous operation to 1850° F.

104. Heavy Duty Cylinders

Logansport Machine Co., Logansport, Ind.—Engineering data on nonrotating, double-acting, square-end cylinders is found in catalog 100-5-1. Cylinders are supplied in five bore sizes from 2 to 6 in.

105. Sling Fittings

Broderick & Bascom Rope Co., 4203 Union Blvd., St. Louis 15, Mo.—Form 3015 points out construction and strength features of wire rope sling fittings.

IMPORTANT READING FOR FOUNDRYMEN

We have a limited quantity of the following reprints which we can furnish while they last.

106. Conveyor Belting

"How to Specify, Install and Care for Conveyor Belting" by Robert H Herrmann presents considerations for normal and high-temperature conveyor belt requirements, speeds, hints on splicing and how to minimize wear as well as suggestions on preventive maintenance.

107. CO_2 Process

"The CO_2 Process—Its Use in British Foundries" by Arnold Tipper describes successful techniques employed in several British foundries for production of molds and cores by the carbon dioxide process.

108. Investment Foundry

"New Precision Investment Foundry Incorporates Specialized Equipment" by Ted Operhall provides a comprehensive description of the facilities, production methods and equipment in use at MISCO Precision Casting Co., Whitehall, Mich.

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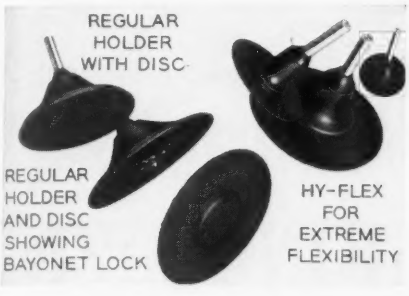
is supplied with magnetic starters, automatic temperature control, pilot safety device and timer which automatically turns off pump and lights signal light at completion of cycle. Washer is supplied either electrically or steam heated as well as gas fired.

For More Details Circle No. 21—Page 171

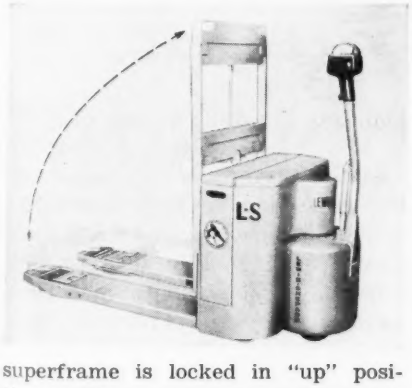
Disc Holders: Foster Supplies Co., 6122 Milwaukee Ave., Chicago 30, Ill.—Coated abrasive discs and flexible rubber disc holders are claimed ideal for grinding and polish-



ing all surfaces, flat to extreme inside or outside contours. Discs are self-centering, balanced and bayonet lock firmly on holders. Grinding heat does not cause loosening. Discs are supplied in grits from 24 to 320 and in six sizes, ¾ to 4 in. Flexible disc holders have shanks of ⅛, ¼ and ⅜ in. for use with the various holders made for the six disc sizes.

For More Details Circle No. 22—Page 171

Pallet Truck: Lewis - Shepard Products Inc., Watertown 72, Mass.—Short-length walkie pallet truck has a hinged superframe so it can handle skid platforms as well as pallets. When used for pallet handling,



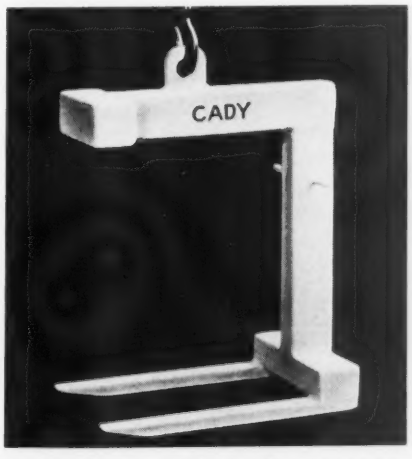
superframe is locked in "up" position. When used for handling skid platforms, the superframe is "down." When equipped with the superframe, the unit is 27⅞ in. longer than the fork length. Truck is available in capacities to 6000 lb. Drive unit is a double reduction gear drive with traction speeds of 3 mph empty and 2.3 mph loaded.

For More Details Circle No. 23—Page 171

Brinell Tester: Tinius Olsen Testing Machine Co., 6084 Easton Rd., Willow Grove, Pa.—Air-operated, semiautomatic brinell hardness tester can be operated by connection to a standard compressed air supply. Fluctuations in air supply pressure above 65 psi are said not to affect the accuracy of the machine. Positive application of standard brinell loads is assured, according to the manufacturer, because the gage mounted at top of machine shows what load will be applied before test is made. Machine is claimed to be as fast or faster than conventional motor driven machines.

For More Details Circle No. 24—Page 171

Crane Attachment: Cady Metal Fabricating Co., 88 Schenck St., North Tonawanda, N. Y.—Alloy steel crane attachments are for transporting palletized materials under existing craneways, monorails or bridge cranes as a supplement to or substitute for lift trucks. It is particularly



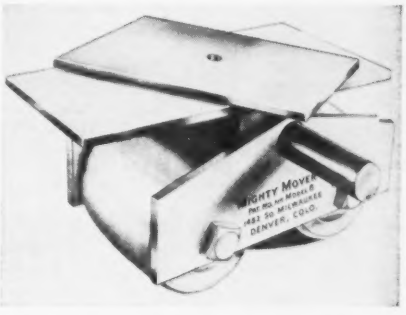
adaptable to moving pallet loads between floor levels in plants or across areas where truck aisles do not exist. Lifters are available in capacities from 1 ton up. Models with counterbalances or adjustable forks can be supplied. Lifter to accommodate special sizes or clearances can be custom built.

For More Details Circle No. 25—Page 171

Finishing Paper: Armour Coated Abrasives Division, Armour & Co., Alliance, O.—No load finishing paper for woodworking applications is said to eliminate accumulation of particles between the abrasive grains, retain its cutting action and lengthen its useful life. Hand sheets, discs and cut sheets for machine sanders in garnet 5/0 grit can be supplied for use on wood.

For More Details Circle No. 26—Page 171

Moving Device: Mighty Mover Co., 1482 South Milwaukee St., Denver 10, Colo.—Moving device is 9 in. long, 5 in. wide and high and weighs 40 lb. Units are designed for moving heavy equipment, can traverse rough or uneven floors, have fully controlled movements, can make 90 degree turns and are guaranteed to carry loads to 90 tons. Movers con-



sist of four dollies, each of which has two 4-in. roller bearing cast iron rollers and a swivel top plate with a standard ½-in. threaded hole. In use, equipment is raised with a mover's jack, movers bolted on, and move completed by pushing or by use of a pry bar.

For More Details Circle No. 27—Page 171

Air Line Filters: Wilkerson Corp., 3367 South Platte River Dr., Englewood, Colo.—Air filters for use with all types of pneumatic equipment are designed to remove all traces of oil and oil vapors, all solid particles over three microns in size, odors, fumes and moisture. In operation, oil, vapors, moisture and contaminants are diverted around the filter by a top baffle and into a sump at the bottom as air is drawn from filter to a center outlet port.

For More Details Circle No. 28—Page 171

Faceshield: Mine Safety Appliances Co., 201 North Braddock Ave., Pittsburgh 8, Pa.—Clear acetate visor

to provide frontal and side face protection against abrasive particles, flying objects and chemical splashes can be attached to any of the company's protective hats. An aluminum pivot arm permits shield to be

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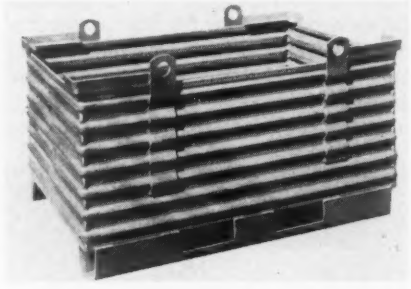
swiveled up or down in any desired position. For replacement, visors are detached from swivel arms.

For More Details Circle No. 29—Page 171

Winterized Roofing: Colonial Refining & Chemical Co., NBC Bldg., Cleveland 14, O.—Company has added a noncongealing agent to its liquid roof coating formula to make a roof coating that can be applied regardless of temperature without requiring heating to achieve proper consistency for spreading. Material is brushed on surface to be treated. It is supplied in either aluminum or black.

For More Details Circle No. 30—Page 171

Skid Box: Palmer - Shile Co., 16033 Fullerton, Detroit 27, Mich.—Corrugated skid boxes have square



corners to prevent them from sliding during stacking. Reinforced rolled edges also provide strength as do lapped seams which replace formerly-used butt welds. Square corners also increase capacity slightly. Boxes are made to customer specifications. Optional features include crane bars and stacking brackets. All have four-way entrances.

For More Details Circle No. 31—Page 171

Midget Chain Hoist: Coffing Hoist Division, Duff-Norton Co., Danville, Ill.—An 11-lb chain hoist reportedly is capable of lifting 250 lb. Hoist has a standard lift of 7 ft and a minimum distance of 9 in. between hooks. Extra chain can be provided for greater lifts. Each unit is factory tested 100 per cent over rated capacity. Trolleys made to fit all standard 3 to 10 in. I-beams can be supplied. Trolleys have carburized, hardened wheels and grease seals.

For More Details Circle No. 32—Page 171

Abrasive: Norton Co., Worcester 6, Mass.—Two barrel finishing media, a vitrified bonded triangular-shaped abrasive and a natural material, have been developed to overcome wedging of abrasive in parts being tumbled and on die castings where conventional abrasives tend to cut through the outside layer of the casting. Triangular shape has the least tendency to wedge and is for

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An Ohio Steel Foundry	$1.35/ton cleaned	$.57/ton cleaned	60%
A Chicago Malleable Foundry	$1.10/ton cleaned	$.60/ton cleaned	45%
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A Steel Processing Plant	$.57/ton cleaned	$.32/ton cleaned	45%
A Cleveland Gray Iron Foundry	$.465/ton cleaned	$.25/ton cleaned	46%

You, too, can make savings of 45% to 60% in your blast cleaning or peening costs the way the firms above have done. Join the more than 1,000 firms that have changed to Wheelabrator Steel Shot in the last two years and let Wheelabrator Steel Shot make king-size savings for you. Start using it today.

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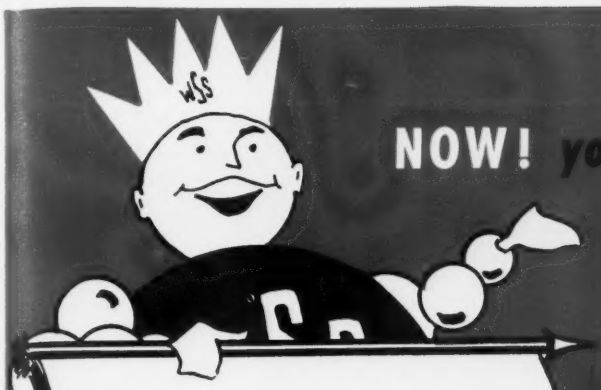

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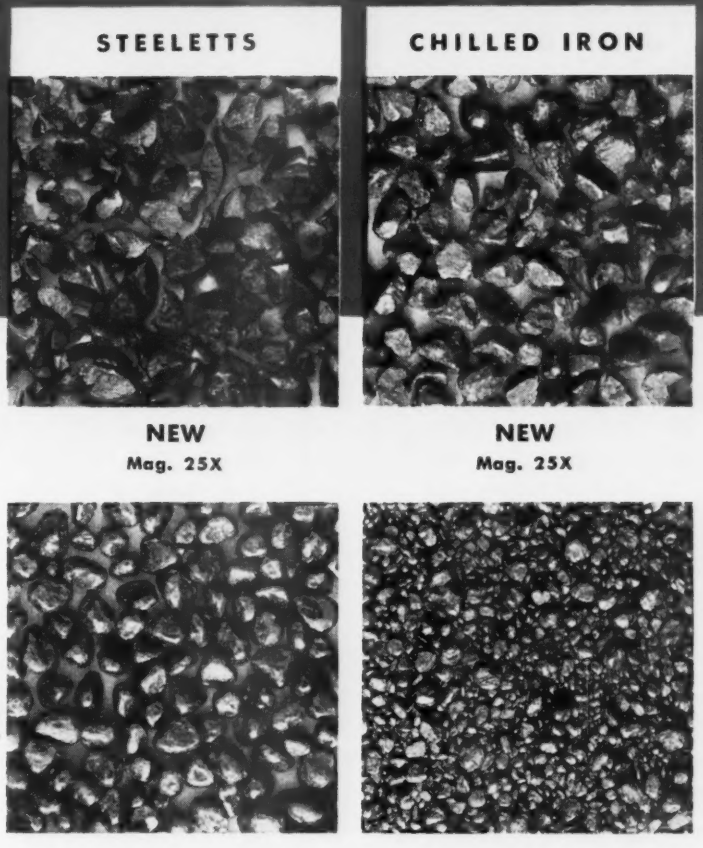

Steeletts are a high-carbon steel grit in the same hardness range as chilled iron but free from the brittle carbides that cause rapid breakdown of chilled iron. Unlike ordinary abrasives, Steeletts retain their grit shape through hundreds of cycles without forming the sharp edges caused by fracturing. Elimination of sharp edges cuts maintenance in half and minimizes embedment problems. Discover for yourself how Steeletts provide the lowest-cost etched finish through high production, low maintenance and low consumption. For additional information on this newest development in steel abrasives, write today for Bulletin 901-D.

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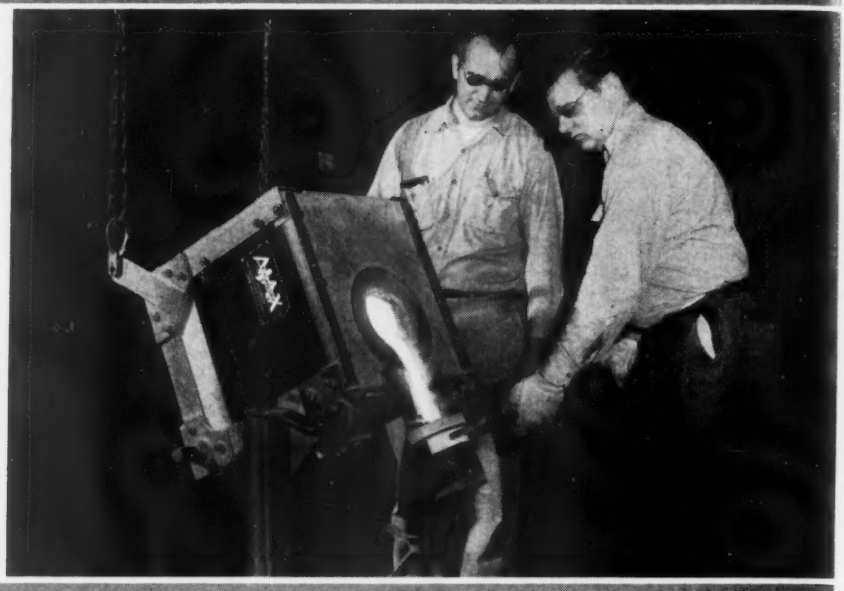
how Ajax induction melting meets investment casting requirements



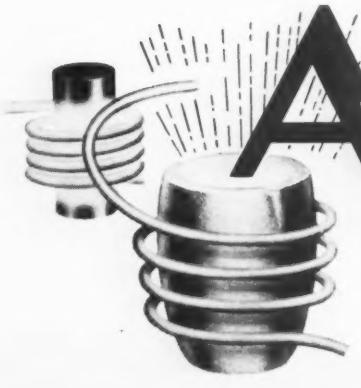
. . . at Precision Metalsmiths, Inc.

The special melting requirements of precision investment casting are an old story to Precision Metalsmiths, Inc., Cleveland, Ohio. This one foundry melts ninety-two different ferrous and nonferrous alloys . . . often in small quantities. Many of these alloys require unusual protection from contamination during melting—and substantially all are made to extremely close analyses. Carbon content in some must be kept *below .04%*.

Only an Ajax-Northrup converter-powered induction melting unit could meet the requirements of versatility, purity, and economy so well. That's why four Ajax units now satisfy all the company's production needs. Three 17 pound capacity portable furnaces are each powered by 20 kw Ajax-Northrup spark gap converters; and the fourth, a fifty pound capacity tilting furnace, is powered by a 40 kw Ajax-Northrup converter.

Precision Metalsmiths standardized on Ajax because Ajax-Northrup units cost far less to operate and maintain in operation. They're ruggedly constructed to take the toughest kind of service in stride. Normal converter maintenance is limited to cleaning the gap chamber and inspection at three month intervals. For additional details, write Ajax Electrothermic Corp., Trenton 5, New Jersey, requesting Bulletins 14-B and 27-B.

Associated Companies: Ajax Electric Company—Ajax Electric Furnace Co.—Ajax Engineering Corp.



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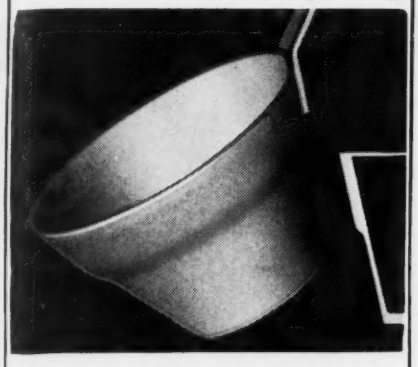
for non-ferrous metal pouring



• New Spincraft ladle design offers you reinforced cup bottoms and pouring edges of heavier gauge with the weight-saving side walls.

You get improved heat transfer . . . new lighter weight and better balance for "swinging" faster, safer and easier between crucible and mold or machine.

NEW LOW PRICES

Now in 23 sizes

¼ to 30-lb. capacity

(in molten aluminum)

• Spincraft ladles actually cost you *less* to use. Prices are lower than ever before. There are new sizes that are *right* for your needs. Deep conical form makes wasteful spilling almost impossible. Handles are "whack-proof." Your choice of stainless steel or mild steel cups. Ladle cups may be purchased separately.

TRY SPINCRAFT LADLES IN YOUR OPERATION

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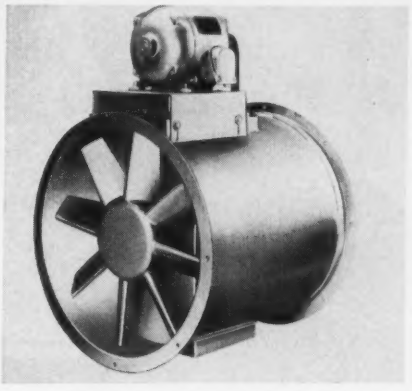
use in cleaning parts with holes, slots and recesses. These shapes can be supplied in four sizes from ⅜ to 1⅛ in. measured on the side of the triangle and ranging in width from 3/16 to 5/16 in. Natural material is supplied in seven sizes from 3/16 to ⅜ in. through 1⅝ to 2½ in.

For More Details Circle No. 33—Page 171

Airfoil Fans: Chicago Blower Corp., 9869 Pacific Ave., Franklin Park, Ill.—Axial airfoil fans in sizes from 12 to 72 in. deliver from 1240 to 102,000 cfm with static pressures



from ⅛ to 3½ in. Wheels of 2, 4, 6 and 8 blades are available for various pressure and volume requirements. Streamline contours are given to all surfaces that contact the air stream. Hubs are formed to approximate the motor diameters and vary from 25 to 70 per cent from the wheel diameters. According to the manufacturer, this feature eliminates turbulence over motor and back flow.

For More Details Circle No. 34—Page 171

Dust Collector: Torit Mfg. Co., 287 Walnut St., St. Paul 2, Minn.—Dust collector can be used with double-end pedestal grinders having wheels up to 10-in. diam, single spindle disc grinders or sanders up to 18-in. diam, tool and cutter grinders, polishing and buffing wheels, surface grinders and lathe operations that create noxious dust. When used with one 4-in. inlet, the unit moves 500 cfm of air at 5700 fpm air speed and a static pressure of 4 in. (water). Unit is available with internally mounted motor.

For More Details Circle No. 35—Page 171

Lenses: Watchemoket Optical Co., 232 West Exchange St., Providence 3, R. I.—Interchangeable, gold, methyl methacrylate lenses are recommended by manufacturer for inspection wear. Under close overhead lights, the gold lenses are claimed to reduce eye fatigue and strain.

For More Details Circle No. 36—Page 171

for FASTER MOLDING and UNIFORMLY SOUND CASTINGS

Cleveland CHAPLETS

• Cleveland Chaplets provide you positive core support with the convenience of uniform stem and plates to speed molding. You'll find that their improved break-off design also reduces handwork to speed cleaning. You'll like the convenience of Cleveland service, too!

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Sand packs tight through open coil for rigid support in mold.

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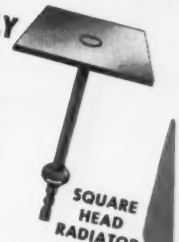
DIMENSIONALLY UNIFORM

Uniform stems simplify molding, prevent annoying sand break-outs.



SQUARE HEAD RADIATOR

EVENLY TINNED for CONTROLLED FUSION

Even tinning over clean metal gives uniform fusion for core support during critical stage.

DOUBLE-HEAD MOTOR CHAPLET

Write today for *sample* and catalog!

Cleveland Since 1890

CHAPLET & MFG. CO.

26471 LAKELAND CLEVELAND 23, OHIO

What's a S

a SPOMATIC, daddy?

"A SPOMATIC, son, is a big machine. It makes sand molds... just like you're doing. But it makes hundreds in an hour. And it does it all day long... all automatically. Another fellow and I run one at the foundry. It's easy!

"Actually, it is more than just a machine. It's a whole new system in itself. This one machine... this SPOMATIC... does more work in one day than a dozen ordinary machines. That's why my boss says it is the biggest money-maker in the business.

"Try to beat the SPOMATIC's performance if you want to, son, but remember... *there isn't a foundry molding machine in the world that can!*"

WORLD'S LARGEST SUPPLIERS OF MOLDING MACHINES

SPO INCORPORATED

6449 GRAND DIVISION AVENUE
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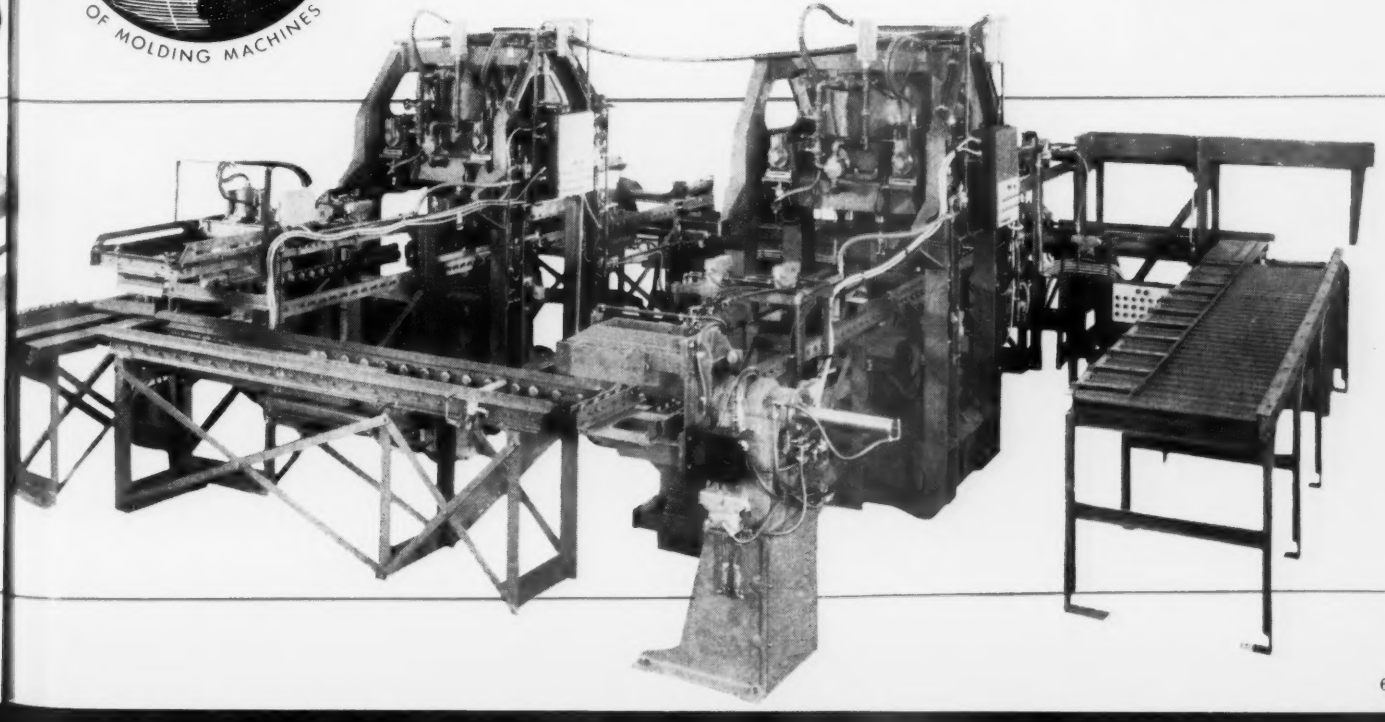
Write For Bulletin "MM For Details.



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SHOT and GRIT

A complete range of sizes, standard or made-to-order.

CHILLED CAST IRON SHOT & GRIT

For tough cleaning jobs or surface finishing of heat-treated parts.

HI-ALLOY "B" CAST IRON SHOT & GRIT

Hi-strength reduces fracturing due to impact.

MALLEABLE SHOT & GRIT

Best for impact type cleaning machines.

STEEL SHOT (Hardened and Drawn Cast Steel)

Ideal for cleaning and peening where carry-out and abrasive loss are minimized.

CUT STEEL WIRE SHOT (Hard Drawn Cut Steel Wire)

Extensively used in peening springs and other metal parts.

Catalog No. AB-53 will give you further details on these stocked items, as well as those manufactured as ordered.

ABRASIVE SHOT & GRIT CO., INC.

SPRINGVILLE, N. Y.

Telephone Springville 1

Proper Storage Is Vital For Coated Abrasives

Humidity and Heat Affect Efficiency of Grinding

THE right combination of controlled temperature and humidity keeps coated abrasives at their best grinding and finishing efficiency and assures ease of handling and use. Climatic conditions may have an effect on any coated abrasive at some time or other, whether the user is located in what is normally considered a dry climate or a damp one.

Continuous studies reported by Minnesota Mining & Mfg. Co., St. Paul, indicate that ideal storage conditions include 1. Constant storage temperature between 65 and 75° F; 2. Controlled relative humidity between 35 and 50 per cent.

Generally speaking, coated abrasive grinding and finishing efficiency increases as humidity decreases. When a coated abrasive product is allowed to dry out too much, however, brittleness, cupping and difficulties in handling nullify the advantages of increased cut. At between 35 and 50 per cent relative humidity, coated abrasives offer the ideal combination of cutting efficiency and ease of handling.

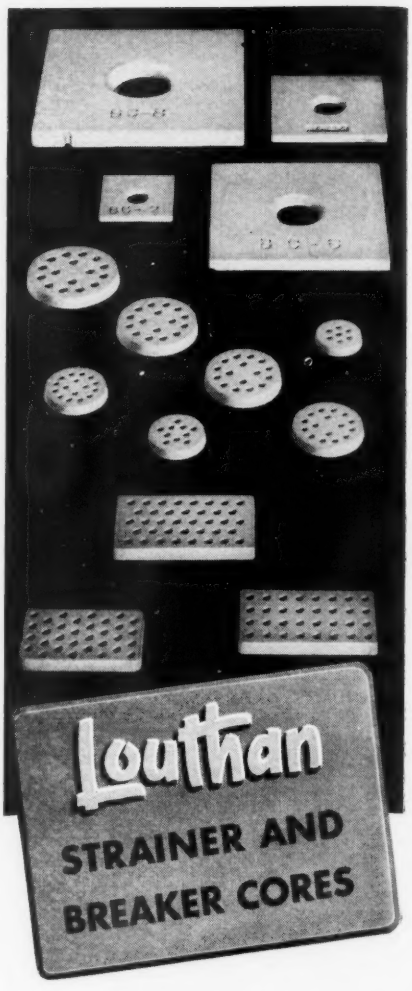
Poor storage conditions may affect coated abrasives in one or more ways. Excessive humidity, for example, may cause a softening of the bond (particularly glue bonds) so that when the mineral grains are presented to the work, they tend to push into the backing or to lie over on their sides, instead of penetrating the work stock.

Excessive dryness, on the other hand, causes brittleness which creates difficulties in handling, possible mineral loss due to the brittleness of the bond, or convex cupping (that is, with the mineral side out) due to shrinkage of the backing as it dries out.

These storage recommendations are suggested:

1. Store coated abrasives on palets, in bins or on shelves, out of direct sunlight.
2. Leave coated abrasive materials in their original packages until ready for use to modify the effects of rapid changes in temperature and humidity.
3. Avoid use of storage areas which might be subjected to alternate hot and cold or wet and dry cycles.
4. Store coated abrasives away from heating equipment or steam lines.

These simple storage precautions



For closer control of molten metal

Louthan Refractory Strainer Cores will not chip, spall or erode, even at temperatures as high as 3,000° F. Dimensionally accurate, they give you uniform casting rates. They keep slag and core-sand inclusions out of castings—save you needless grinding and rejects. Try them! Complete range of standard sizes. Special sizes to order.

Louthan Refractory Breaker Core Shapes generate no core gas when exposed to heat of molten metal. They are smooth, strong, resist breakage. Try them! Complete range of standard sizes. Special sizes to order.

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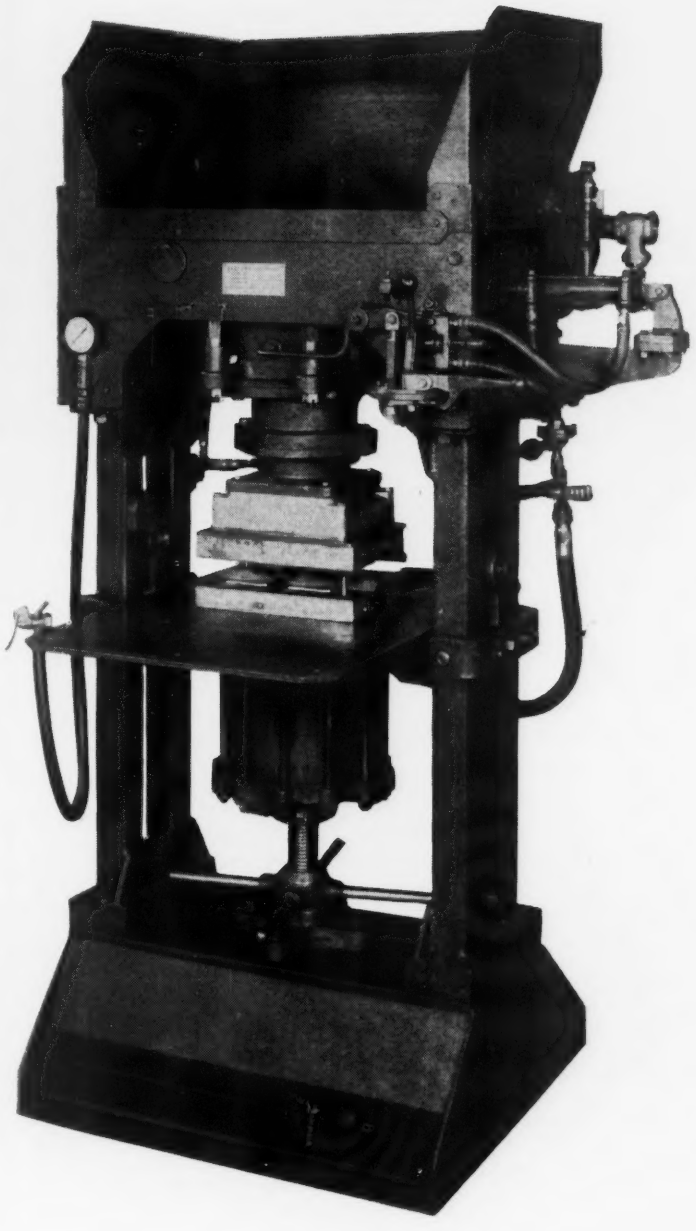
The Louthan Manufacturing Company EAST LIVERPOOL, O.

Redford No. 4-D DRAW TYPE CORE BLOWER



Designed primarily to fill the need for a fast and flexible draw type machine to handle work from a few ounces to 10 lbs., the Redford #4-D can be quickly adjusted to accommodate core boxes not requiring the draw feature, or can be equipped with a clamp to handle vertically parted core boxes.

Rugged construction, simplicity of change-overs and a fast operating cycle make it suitable for either jobbing or high production work.

Exhaust air is utilized to thoroughly fluff the sand remaining in the sand magazine after each blow, thus reducing the possibility of cratering.

The stationary sand magazine and accurately guided draw table assure perfect drawing of the cores. Vibration of the core box is automatic.

Magazine heads normally furnished with the #2 Redford machine can be used with the #4-D Redford. Larger new type magazine heads especially suited for draw type work are also available as standard equipment.

Valves are designed to assure maximum safety. The operator must use both hands at the same time in order to clamp the core box.

The Redford #4-D has been thoroughly proven in both small and large foundries. To get complete information write for Bulletin 4-D.

Redford IRON & EQUIPMENT CO.

20733 GLENDALE AVENUE • Phone KEnwood 1-8611 • DETROIT 23, MICHIGAN

When **ACCURACY** *is a* **MUST!**

insist on...

SCIENTIFIC MATCH PLATES

Pressure Cast

- Molded in plaster for extreme accuracy
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- Backed by an 18-year reputation for quality

"Ask the man who's used them."

The SCIENTIFIC CAST PRODUCTS Corp.

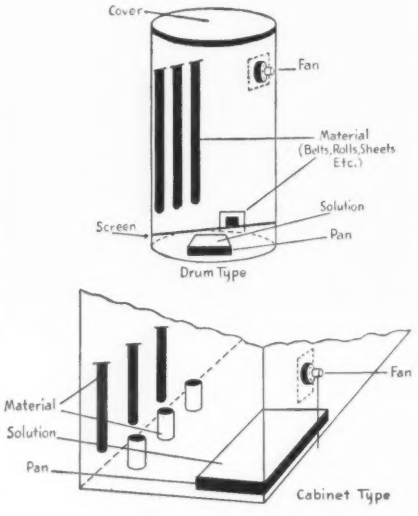
1390 East 40th St., Cleveland 3, Ohio

2520 West Lake St., Chicago 12, Ill.

will pay off in maximum service from coated abrasives. It is noted, for example, that glue-bond papers have been stored for 10 years at approximately 50 per cent relative humidity and 70° F without noticeable deterioration.

In areas subject to rapid or extreme seasonal changes in climate, good storage can be provided by cabinets or entire rooms, depending on the volume of coated abrasives consumed. Such storage facilities range from a simple 55-gal drum or airtight metal cabinet to a walk-in unit. Examples appear below.

The small conditioner is made by placing an enameled pan about 9 x



Drum and cabinet-type conditioners

18 x 2 in. in the bottom of the drum or cabinet. This pan will hold a saturated solution of a humidity control chemical mixed with water. A heavy screen is placed over the pan to prevent the abrasives from touching the solution. Necessary air circulation is provided by a small fan installed in the side of the drum, near the top, with the motor on the outside to eliminate the possibility of corrosion.

The container cover should fit tightly, yet allow easy access. Flat stock, such as sheets and discs, is placed on the screen for conditioning; short belts are hung on hooks attached to the inside of the barrel.

It should be noted that it takes a minimum of about three days to condition coated abrasives which have been affected by humidity. It therefore is necessary with the smaller type of unit to anticipate future needs for coated abrasives and to place them in the conditioner accordingly.

Potassium carbonate has been found to be highly effective for humidity control because its humidity range centers at about 43 per cent;

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FACT:
Without good bentonite your sand molds will produce costly REJECTS.
FACT:
NATIONAL BENTONITE is the Finest Quality Obtainable,
mined from the world's purest sources of bentonite . . . processed by the world's largest producers of bentonite.

It's a proved fact that the quality of bentonite you use in molding can determine the amount of money you lose by rejects. Try and save a few cents by using poorer quality bentonite and you may lose hundreds of dollars. Good bentonite is good insurance for your profits . . . and good bentonite means National Bentonite. Here's why:

National Bentonite is selected from only the finest types of bentonite in the world. It is processed with laboratory exactness so it is always the same, uniform high quality. It provides excellent mold durability, yields higher permeability, has good green strength, higher tensile strength, higher hot strength, and higher sintering point. Besides that, National Bentonite requires less water to bond, so reduces the amount of vapor to be vented. All points considered, National Bentonite offers you greater quality and better characteristics to make good sand molds. This is why scores of good foundrymen have specified National Bentonite for years.

Available from better foundry suppliers everywhere. Write or phone today for specifications and prices.

Baroid

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5023

DUREZ®

SHELL MOLD RESINS

trigger 3-way cost reduction in bronze door castings

PHOTOS COURTESY REVOLVING DOOR DIVISION OF INTERNATIONAL STEEL CO.

READ FOR PROFIT the up-to-date "Durez Guide to Shell Molding." Acknowledged as outstanding in the field, it's free on request.

"We reduced the cost of the castings themselves as compared with green sand molding. We also eliminated about 50% of the machine operations and about 50% of grinding and finishing time."

The producers of the two dozen different castings used in this revolving door assembly get shell molding at its best . . . with Durez phenolic resins. They save metal. Rejects are down. Grooves and holes formerly machined are now molded in.

Results like these add up to lower manufacturing costs, higher profits, more salable products. Find out how Durez phenolic resins can help you improve your operations and strengthen your cost position. We are used to working with foundries and can help with shell mold problems.

DUREZ PLASTICS DIVISION

HOOKER ELECTROCHEMICAL COMPANY

1002 WALCK ROAD, NORTH TONAWANDA, N. Y.

HOOKER CHEMICALS

it is low in cost and can be handled easily with normal caution. One tray of potassium carbonate properly maintained in a saturated solution will control 40 to 50 cu ft of air. A saturated solution is, of course, one which contains an excess of undissolved crystals. Proper maintenance includes retaining the saturation in high humidities and adding water at low humidities.

Other relatively harmless chemicals and the humidities which can be expected fom each are calcium chloride, 32 per cent, and sodium dichromate, 52 per cent.

Where coated abrasive consumption is such that a walk-in storage unit is desirable, it is advisable to call in air conditioning specialists to make recommendations for proper equipment.

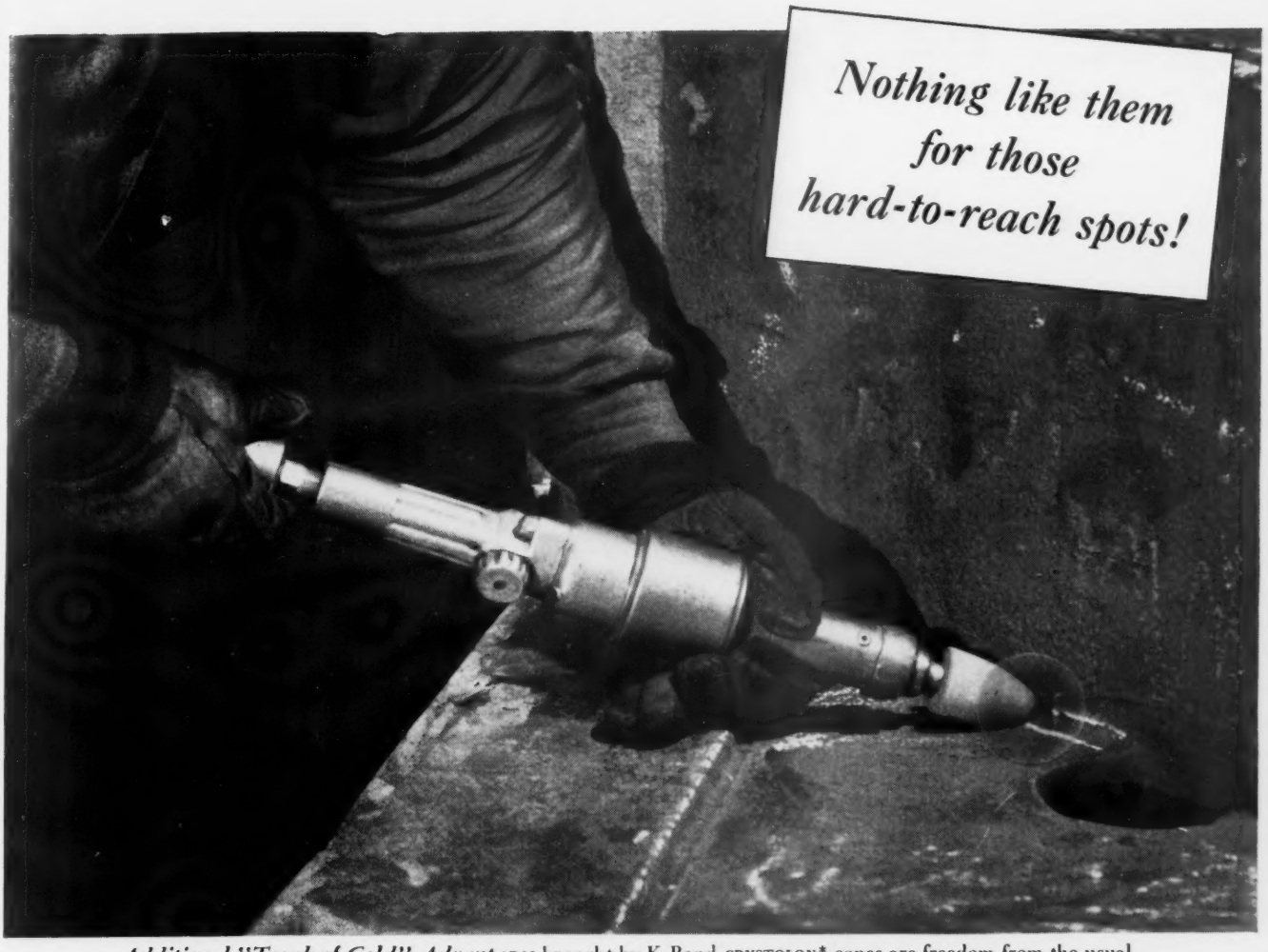
For checking humidity readings, a direct-reading humidity instrument is acceptable; however, a stationary wet and dry bulb humidity gage is the most effective instrument. Wet and dry bulb readings are simply converted to relative humidity. In the large room, relative humidity is most accurately measured with a sling psychrometer.

Connecticut Becomes First AFS Chapter in New England Area

The first chapter of the American Foundrymen's Society in New England was officially installed Nov. 22, at Cheshire, Conn., becoming the 43rd industrial chapter in the national organization. Meeting sites will be rotated throughout the state to permit personnel of all foundries to participate in society - sponsored events at both national and local levels.

Don Sawtelle, Malleable Iron Fittings Co., Branford, has been elected to serve as first chapter chairman. Others officers are Arthur E. Row, Producto Machine Co., vice chairman; Hugh Pope, Eastern Malleable Iron Co., secretary and Fred C. Irving, Aluminum Co. of America, treasurer.

Nine directors complete the local board: C. Wesley Case, Belknap Mfg. Co.; James E. Chafey, Chase Brass & Copper Co.; Gordon B. Mannweiler, Eastern Malleable Iron Co.; Roderick R. Washburn, Plainville Casting Co.; Robert J. Brandt, Pennsylvania Foundry Supply Co.; G. L. Richter, Farrel Birmingham Co.; Clayton D. Berry, Hartford Electric Steel Corp.; Frank B. Diana, Frank B. Diana Co., and James Baxter, Malleable Iron Fittings Co.



Additional "Touch of Gold" Advantages brought by K Bond CRYSTOLON* cones are freedom from the usual grooving and chipping of vitrified cones on gray and malleable iron applications.

Norton K Bond† Cones

resist grooving and chipping . . . add the saving "TOUCH of GOLD" for snagging gray and malleable iron

The Norton K Bond is the most radically improved vitrified bond ever developed for slow speed snagging of gray and malleable iron.

That's why, every time K Bond CRYSTOLON wheels or cones go to work for you, you can count on these profit-boosting "Touch of Gold" advantages:

1. Faster, freer cutting action
2. Much longer wheel life
3. Less frequent dressing
4. Hold corners better
5. Consistently duplicated

K Bond Cones Stand Up Better

In particular, CRYSTOLON cones made with this outstanding bond overcome the usual tendency of vitrified bond cones to groove excessively and chip off when snagging difficult places on gray or malleable iron castings. On these jobs the following reports are typical of very many received from foundries:

"K Bond cones hold form with no chipping. Best ever used."

"Excellent cutting action. Cones lasted an average of 10 hours — longest service life we ever got."

"These cones last us 50% longer than any others and they're tops for fast cutting."

"For durability and cut, K Bond wheels are far the best we ever tested."

See your Norton Distributor about arranging a test of K Bond CRYSTOLON cones and wheels in your own plant. NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your phone directory, yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass. W-1624

Making better products... to make your products better

NORTON

and its BEHR-MANNING division

NORTON: Abrasives • Grinding Wheels • Grinding Machines • Refractories
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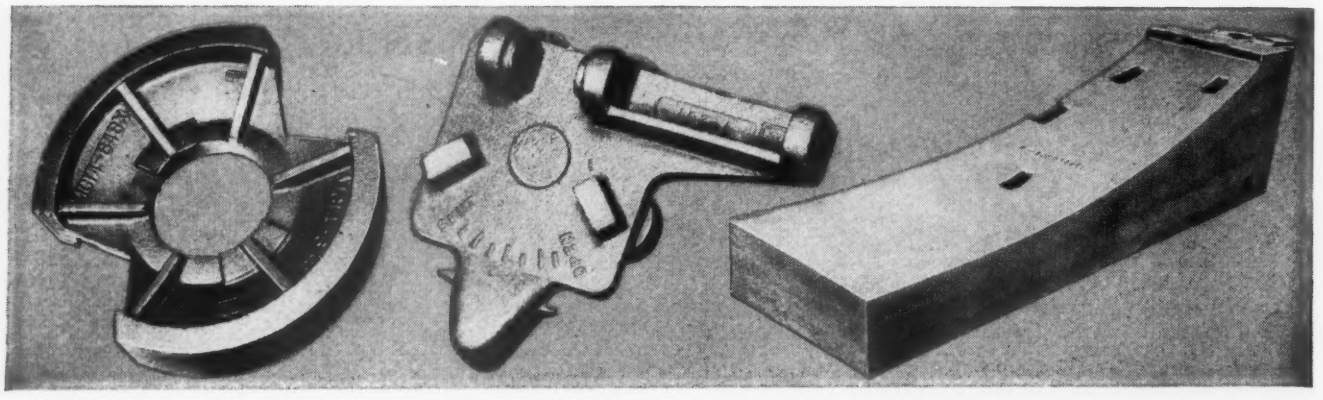
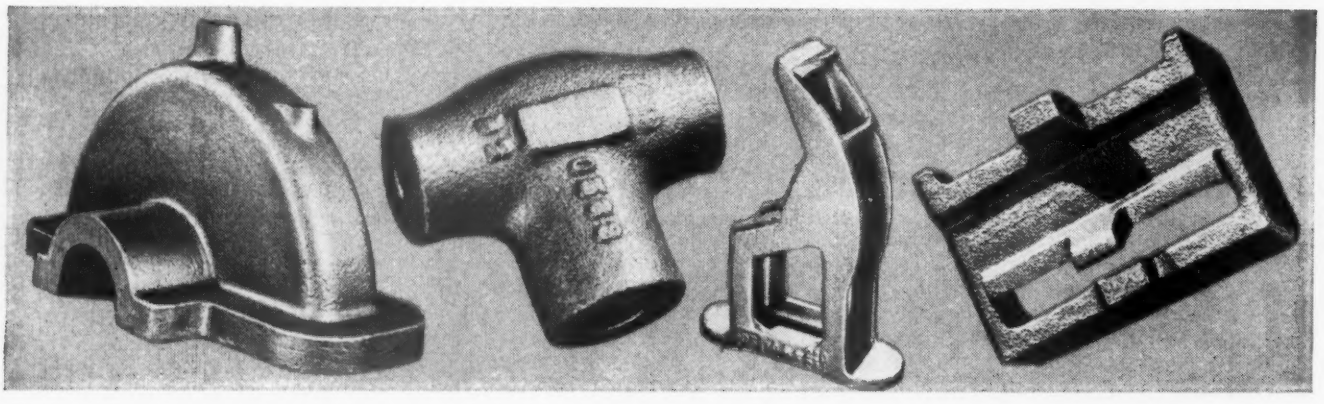
†Patent applied for

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

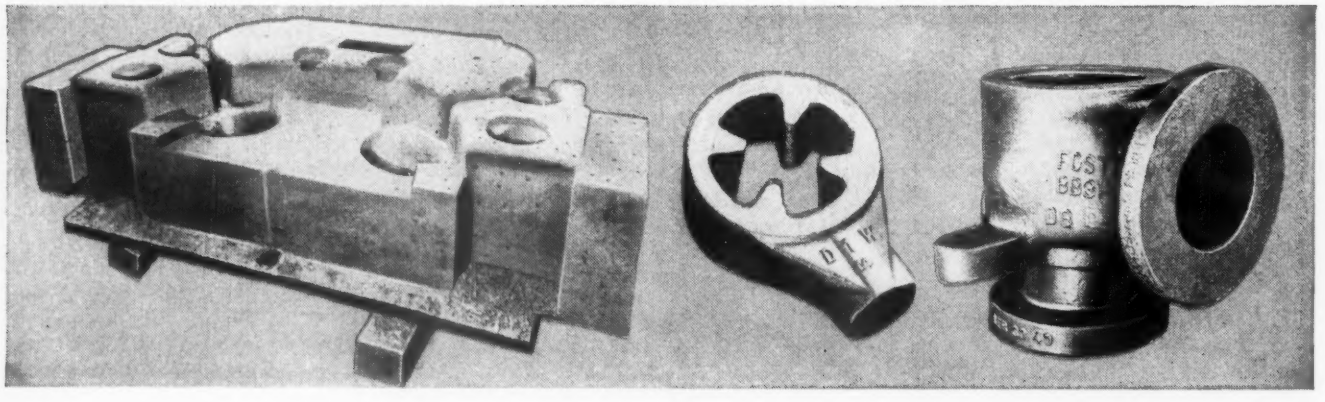
LARGE OR SMALL, IRON OR STEEL,



WHEREVER METALS ARE CAST,



YOU CAN USE TRULINE® BINDER



Naval-Stores Department **HERCULES POWDER COMPANY** INCORPORATED *920 King Street, Wilmington 99, Del.*

NF55-2

Meditations of a Sandman

By HAROLD E. HENDERSON
H. C. Macaulay Foundry Co.
Berkeley, Calif.

IN 1942, Uncle Sam in one breath told foundrymen that they must increase castings production for the war effort and in the next that their supply of essential alloying materials would be restricted drastically.

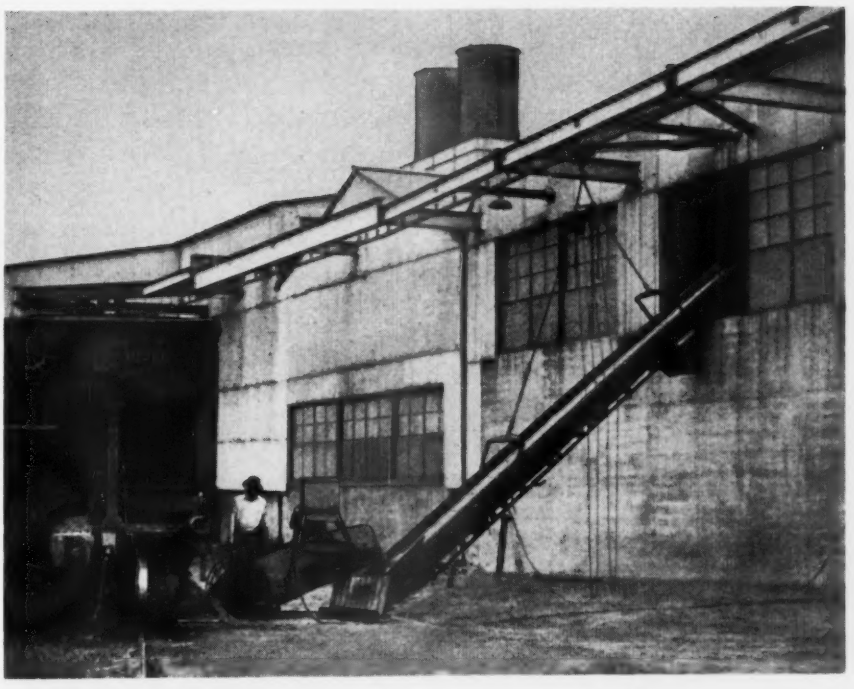
While one government department screamed for castings, another insisted that castings were used only for sash-weights and manhole covers and that this production could be suspended for the duration. Another Washington bureau deplored the fact that American brass mines had been totally depleted. Do you recall those frustrating days?

It was about that time that our West Coast foundries also were feeling the full impact of the war effort. Henry Kaiser was building ships at an unprecedented rate, and his demand for castings added to the already congested condition of many of our San Francisco Bay area shops. As might be expected, an abnormal increase in business is accompanied by a proportionate increase in human confusion and in casting defects.

Those of us who were still on speaking terms began to compare notes, and we were not entirely surprised to learn that sand failure definitely was on the increase and that we simply didn't know what to do about it.

It was at this point that we decided to organize a local sand committee. A letter sent from the AFS chapter office to the owner of each foundry within a 25-mile area, announced the first meeting of the proposed committee and requested that each shop be represented by at least one man directly responsible for or interested in its sand program. Some 40 or more men attended that first gathering, and a tentative plan of organization was discussed and adopted. We decided to meet twice a month. One meeting would be held at a restaurant, where a speaker of national reputation would be featured, if available.

In the matter of speakers we were decidedly fortunate. During the four years of our existence, programs were adorned with such names as Charles



Man-hours reduced

90½%

by unloading 50-ton hopper cars

with Farquhar Conveyors

NOW it takes one man only three hours to unload sand and coke from 50-ton hopper cars at this foundry*. That's a cost-saving switch from the old days when it took four men a full eight hours to do the same job! And Farquhar's standard Under Car Unloader and Trough Conveyor established this remarkable money-saving record.

The foundry's Chief Engineer reports:

"The savings we have made in handling costs are considerable; in fact, we have never had any equipment which paid for itself in such a short time . . . Noteworthy from the engineer's and maintenance man's viewpoint is that even the smallest parts (of Farquhar Conveyors) are well designed and, therefore, assure trouble-free operation of the whole unit."

Put Farquhar Bulk, Power-Belt and Gravity Conveyors to work in your foundry on both raw and finished material handling jobs. They'll pay their way in just a few month's operation . . . and pave the way to bigger and better operation profits year after year.

*Company name on request.

Write for free catalogs . . .

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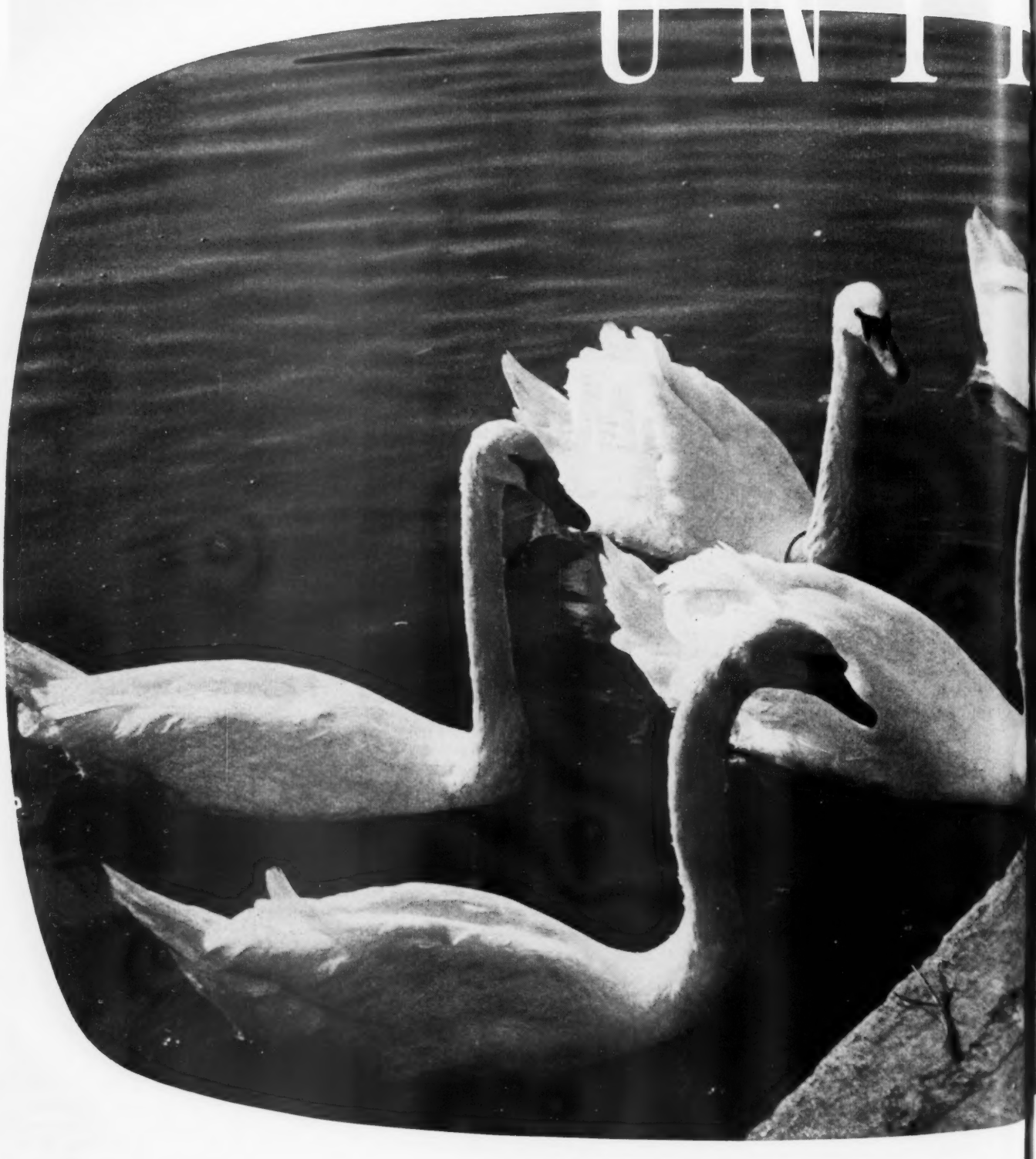

The Mute Swan is not a native bird, having been introduced from Europe. Nor is it mute, for when angry it hisses and when calling its young it makes a noise similar to the bark of a small dog. In England, the swan is regarded as a royal bird and ownership must be approved by the crown. This is an ancient custom, enacted in 1482 during the reign of Edward IV. To this day, the swans on the Thames belong to the crown and two city companies, all three having distinct "swan-marks" on their respective birds.

The Mute Swan, the swan of our parks and country estates, is another of Nature's families distinguished by identical appearance. This uniformity is especially noticeable when a group of swans, such as shown here, gathers at the edge of a lake or glides with ease and grace over the water.

HINES Pins and Bushings, too, are noted for uniformity. Carefully machined from the finest steel, hard chrome plated and precision ground to .002″ tolerance, they possess accuracy and uniformity rarely, if ever, found in nature. For pins and bushings that assure quick, accurate alignment, won't rust, don't require lubrication—pins and bushings that will give exceptionally long, satisfactory service—it's HINES!

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THE HINES FLASK CO.,

3431 WEST 140TH STREET, CLEVELAND 11, OHIO • TELEPHONE: ORCHARD 1-2806

YOUR BEST *Tip* IN CARTS

No. 119
Sterling
HEAVY-DUTY CART

If you're looking for a good tip for wheeling coal, scrap, chips, turnings or similar heavy materials, see these Sterling Heavy Duty Carts. Over and over again the "3-Point Landing" feature of this well-balanced cart will convince you it's the best buy for years of service. Can be furnished with pneumatics, as shown, or steel wheels . . . plain or roller bearings. Write for Catalog.

3 SIZES AVAILABLE:

No. 119..... 7½ cu. ft.
No. 120..... 9 cu. ft.
No. 121..... 11¼ cu. ft.

STERLING WHEELBARROW CO., Milwaukee 14, Wis.

A HALF CENTURY OF PROGRESS

Look for this Mark of STERLING Quality

Sterling WHEELBARROWS

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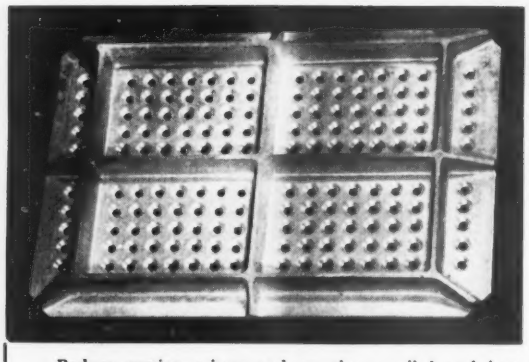


CUSTOMCAST
Aluminum BOTTOM BOARDS

. . .

Standard or Special

Reduce casting rejects and greatly curtail board losses with "CUSTOM-CAST", lightweight, rustproof, Aluminum bottom boards . . . at prices that will amaze you.

No charge for patterns on minimum orders of 50 or more custom boards.

Non-warping and non-burning, our boards assure uniform molds every time. Stacking problems eliminated. Boards not affected by weather.

Rib reinforced for strength and rigidity, with vent holes on face to permit gas escapement.

A raised sand strip around the outer edge peens each mold uniformly and eliminates sand slippage.

In event of accidental breakage or obsolescence, boards will be bought back by us at better than scrap prices.

Write for price list of standard sized boards which may meet your needs or send a sketch with dimensions on your custom board for our quotation and early delivery date.

This letter opener is a typical example of a sculptured aluminum product, produced for Mr. "Cliff" Cornell; well known in the foundry trade.

WEST WAY PATTERN WORKS
9617 CLINTON ROAD • CLEVELAND 9, OHIO

Manufacturers of the Famous Contemporary Metalcraft Sculptured Aluminum Plaques for Home & Industrial Gift Giving—Special Plaques are our Specialty. Inquire.

Schureman, Adrian Den Breejen, L. P. Robinson, Otto Rosentreter, Clyde Sanders and many others. Charlie Schureman delivered the first formal "sand lecture" to the group and solemnly informed our top brass that they had "morons on their mullers." Since then, "Charlie Schureman Night" has been an annual occasion which never suffers from lack of attendance. We look to him for latest information on sand control, and we never tire of his repeated admonition. "Learn to do the old things right!"

At our second meeting each month we visited a local foundry (by invitation), where we inspected the sand practice and casting finish and had a roundtable discussion of the sand problems affecting that shop. Our host first explained the instances of sand-failure experienced, then described in detail the remedial measures resorted to. Each man at the table was invited to express his opinions of the situation freely and to explain just what he thought should be done to correct matters.

At first, some of the boys were quite reticent. There was fear of exposing one's ignorance or of incurring ill will by being too frank. As we became better acquainted, however, this feeling of distrust was dissolved completely, and the general desire for knowledge became predominant.

Foundrymen who previously had looked upon each other with ill-disguised contempt now frequently consulted each other regarding experiments or changes in their sand practice. If someone was considering the purchase of sand equipment, every man of our committee had something to say about it and seemed to feel personally responsible for its subsequent success.

The installation and operation of any new sand machine was a matter for excited general discussion. The strong and weak points of such a machine were emphasized from every angle. One might have thought that each of us had a financial interest in the new project. Of one thing we felt sure—our industry would benefit by the expression of these opinions.

A friendly rivalry developed wherein each shop strove to improve its sand practice. More and more new machinery came into the area, new and better laboratory equipment was utilized, and better weighing and measuring devices were pressed into service. But most important of all, our boys were by then fully conscious of the need for controlling the properties of their sand.

The fellow who at first apologized for even attending our meetings, who was actually afraid to open his mouth, had become quite voluble in

A TON OF PROOF

FLIES THE PACIFIC.....

March 15
"Please rush, via Air Freight, one ton of hot process resin coated sand for test in our plant."
Toyo Kogyo Company, Ltd.
Hiroshima, Japan

September 1
"Test successful . . . . . Enclosed is contract for 1,000,000 lbs. of resin and equipment for producing hot process resin coated sand" (PlastiSand)
Toyo Kogyo Company, Ltd.
Hiroshima, Japan

A strange mission—flying a ton of sand over the Pacific. But, this was no ordinary sand. This was PlastiSand—liquid resin coated sand for use in foundry shell molding.

In their eagerness to test this revolutionary process, the Toyo Kogyo Company, Ltd. requested delivery via air freight. It was a ton of proof. Proof of savings in time and efficiency—proof of safety—proof of superiority of molds. The first order for 1,000,000 lbs. of resin followed.

Toyo Kogyo Company, Ltd., Japan, is one of the largest automotive foundries in the Far East.

PlastiSand® PROCESS

Resin formulation and the coating process covered by Patents 2,706,163 and 2,706,188

PlastiSand Process utilizes a revolutionary new method for coating sand with liquid-resin for foundry shell molding.

This development by Acme Resin Corporation in the field of shell molding has several positive advantages. PlastiSand is DUST FREE, NON-CLUMPING, NON-SEGREGATING and ECONOMICAL.

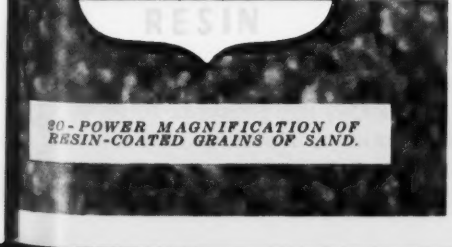
Foundries using the PlastiSand Process report Proved Savings, Proved Safety and Proved Superiority of molds with as little as one-half the resin content formerly necessary with dry resin.

With the PlastiSand Process, a shorter dwell is possible and a faster cure is assured, from a shorter time on the pattern and a faster baking cycle.

Acme's new PlastiSand Process is adaptable to dump-box, roll-over and blowing of either shells or cores.

Send for informative folder, today!

ACME RESIN

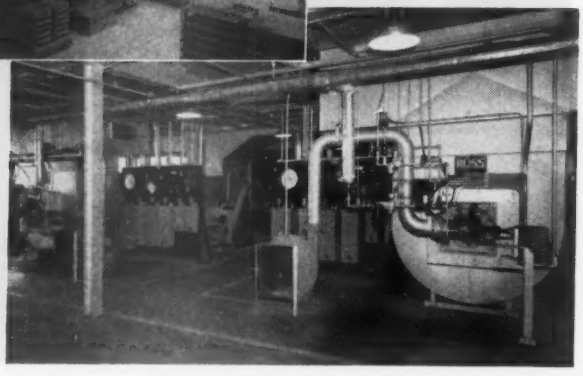


80-POWER MAGNIFICATION OF RESIN-COATED GRAINS OF SAND.

ACME RESIN CORPORATION
1401 CIRCLE AVENUE • FOREST PARK, ILLINOIS

Automation comes to CORE BAKING with modern ROSS Ovens

View from entering end of ROSS oven showing catwalk and conveyor drive, with heater and air tempering coils housed above oven.



ROSS heating equipment showing burner end of heater, recirculating ductwork, filters, etc. Note compact grouping of controls and starting equipment.

ROSS Overhead Nozzle System Insures Uniform Air Distribution

For one of America's leading automobile manufacturers, core baking has been really mechanized to effect sizable savings in material and operating costs. The two ROSS Horizontal Core Bake Ovens, each complete with heating and cooling equipment, are designed with conveying apparatus both inside and outside of the oven.

Each oven consists of 4 baking passes and 2 cooling passes in a separate insulated enclosure. Rows of specially designed and directed nozzles insure even distribution of treated air.

ROSS Conveyorized Core Baking Systems can prove a paying investment for large or small foundries. Write us for detailed information.

Inquire about the ROSS Hot Blast Heating System that greatly increases tonnage while saving coke, labor and repairs. Can be installed with no interference with melting schedules.

J. O. ROSS ENGINEERING CORPORATION

***Main Office:* 444 MADISON AVE., NEW YORK 22, N. Y.**

Atlanta • Boston • Chicago • Detroit • Los Angeles • Seattle

ROSS ENGINEERING OF CANADA, LIMITED, MONTREAL, CANADA
CARRIER-ROSS ENGINEERING COMPANY, LIMITED, LONDON, ENGLAND

his enthusiasm over the success of his own experiments. One foundryman openly stated that his company had so obviously benefited from the activity of this committee that it would be willing to defray all expenses of the group. However flattering the offer, ethics required that we decline it.

There was nothing profound or scientific in our investigations. Few of our group had enjoyed the benefits of a college education, but those few were extremely helpful in all of our deliberations. The rest of us came up the hard way, and most of us recognized that we hadn't come very far. Regardless of education, however, we were aiming at a common goal, better sand practice for all, and demonstrating democracy in its most practical form.

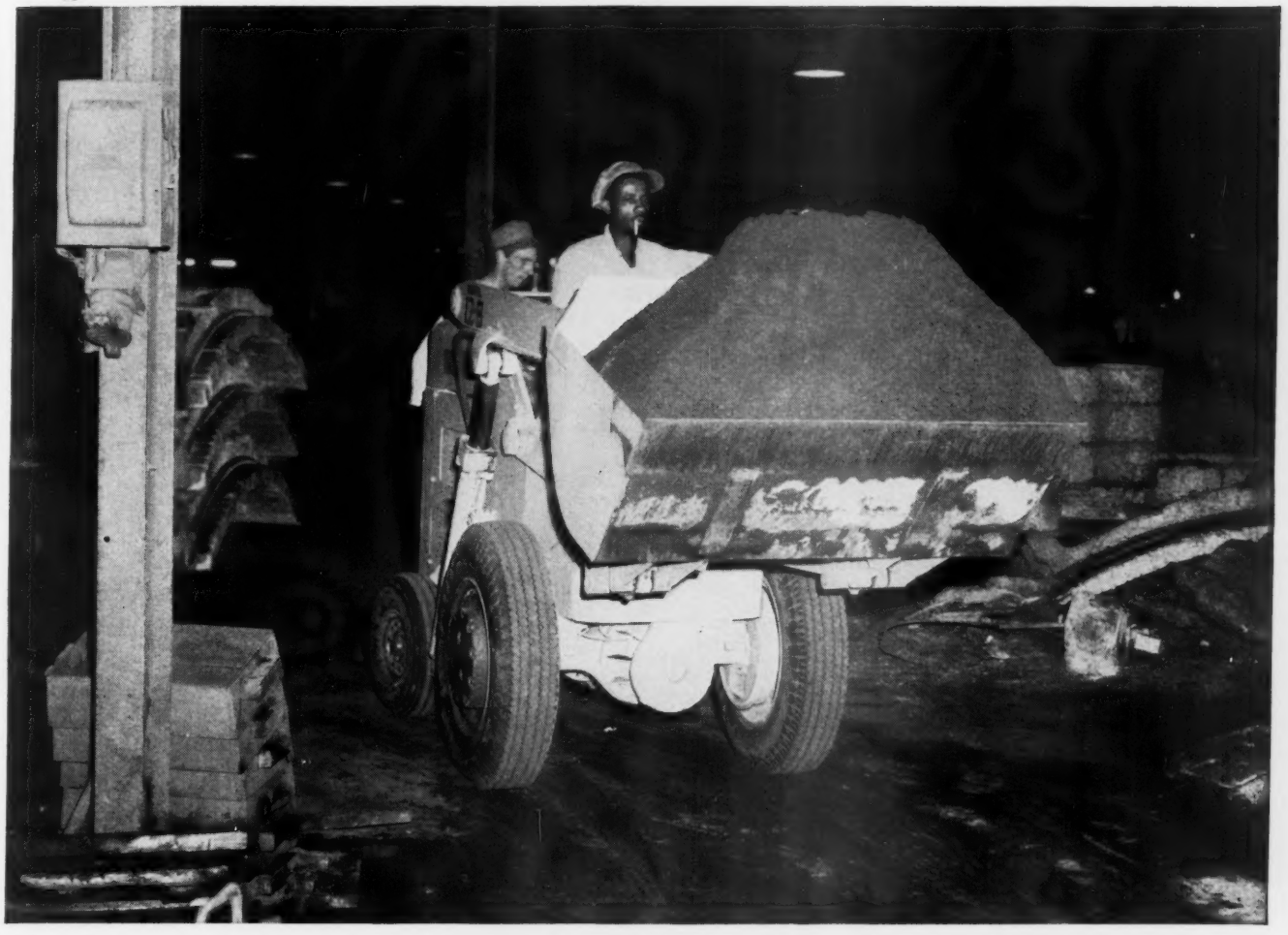
An endless stream of questions concerning every imaginable phase of sand practice, was asked and asked again. The answers always were interesting if not conclusive, and we rarely concluded a meeting without someone present finding a solution to a current problem. Of course, human nature being what it is, we could hardly have been expected to see eye to eye on everything.

The "Northern California Committee on Sand and Mold Materials" enjoyed four fruitful years of life, then died a death that might be attributed to complications. Some thought that we were getting too big for our britches, that we were attracting too much attention and perhaps suffered from delusions of grandeur. Others contended that we had outlived our usefulness. Perhaps it was apathy that actually delivered the death blow. However brief, the committee's lifespan was completely justified, and there seems to be some hope of a resurrection.

Investment Casting Institute Elects Five New Members

Five new companies have been elected to membership in the Investment Casting Institute, Chicago. The companies and their official representatives to the institute include Dean Precision Casting Co., Minneapolis, represented by Charles Bader; Lawrence Laboratory, Santa Monica, Calif., represented by Lawrence Schwedes; Carbide & Carbon Chemical Co., Division of Union Carbide & Carbon Corp., New York, represented by Charles McClelland; Montrose Chemical Co., Newark, N. J., represented by B. L. Rothberg; and Stratos Division, Fairchild Engine & Airplane Co., Bay Shore, L. I., N. Y., represented by F. William Cook.

Report on the new MICHIGAN 12B



Clark's exclusive power-shift transmission

eliminates the most notorious cause of excessive maintenance

No engine clutch, no clutch pedal, no gear clash! Clark's power-shift transmission is standard equipment on the new 15 cu. ft. Michigan Tractor Shovel—completely eliminates this notorious cause of excessive maintenance and down-time.

Instant power-shifting. In place of the conventional gear-shift levers and clutch pedal, the Michigan has a single power-shift lever on the steering column. You can make any shift instantly, even when moving: simply push the lever to High, Low or Reverse position. As any operator will tell you, *it sure beats riding a heavy clutch all day.*

Faster cycles. There's no hesitation, no gear clash, no loss of momentum when you shift—saving seconds or minutes on every cycle. Power-shifting also makes the Model 12B more maneuverable in boxcars and narrow aisles, since you don't have to fumble with conventional levers and clutch pedal.

Heavier, more power. The new Michigan is 20% heavier and more powerful than most machines in its class. With this margin of weight and power, plus low-level independent bucket action, the 12B *digs* where other machines spin their wheels.

See it in action. The complete power train of the new 12B—power-shift transmission, 3-to-1 torque converter and planetary wheel axle—is designed and manufactured by Clark, specifically for the roughest kind of industrial bulk handling. Complete dust protection features are standard; gas or diesel optional. See the new 12B in action, on your own job—write us to arrange a demonstration.

The new Michigan 12B is available on Clark's no-down-payment Lease Plan; clip this coupon to your letterhead and mail it for details.

Michigan is a trade-mark of

CLARK EQUIPMENT

Arrange demonstration of Model 12B:

CLARK EQUIPMENT COMPANY
Construction Machinery Division
2475 Pipestone Road
Benton Harbor 4, Michigan

Around the Country

NEWS REPORTS FROM

Chicago . . . New York . . . Pittsburgh . . . Los Angeles . . . Philadelphia

Chicago— Ferrous castings makers in this area—like those in other major foundry centers—show increasing concern over scrap prices and supply. Prices advanced steadily during last half of 1955, supply grew less plentiful and quality deteriorated.

These matters were subjects of discussion at the 28th annual convention of the Institute of Scrap Iron and Steel in Chicago, Jan. 3-6. Views and fears of ferrous foundrymen were presented when Don H. Workman, executive vice president, Gray Iron Founders' Society, Cleveland, addressed a convention session.

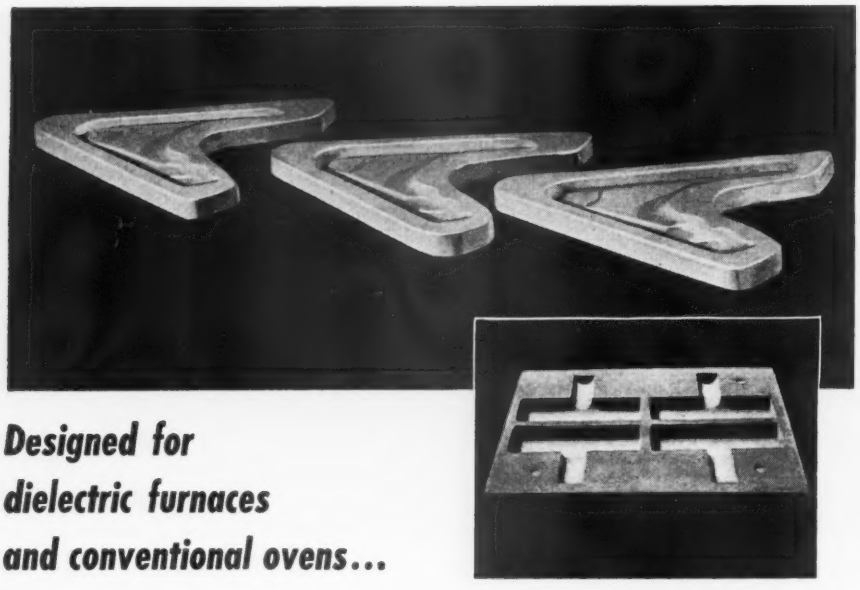
Mr. Workman stated that gray iron foundries had a good year in 1955 and prospects are that 1956 may show a gain up to 5 per cent. Ferrous foundrymen believe, therefore, they now may be on the threshold of another serious shortage of good scrap. He said further that most foundry people think the loss of metallics via exports is dangerous to our economy right now and would be a downright catastrophe in event of another national emergency. The fear of quality deterioration Mr. Workman spelled out in some detail.

David C. Holub, Institute president, pointed out "at no time in 1955 was the scrap industry under any strain—indeed, most times it was looking for markets—and not one furnace was taken off nor one pound of production of steel ingots or iron castings lost due to shortage of scrap." He also reiterated the Institute's stand—that of equal treatment of scrap with other metallics or products made by use of scrap. "If there was any emergency, present or threatened, which should necessitate retention of scrap at home, then the scrap industry maintains that similar policy should govern exportation of iron ore, pig iron and steel."

Edwin C. Barringer, executive vice president of the Institute, said that 34 million tons of purchased scrap (including industrial scrap) was generated for domestic consumption in 1955, along with about 4¼ million tons for export. This, he stated, exceeds any previous year by about 10 per cent, and without undue pressure the industry could have supplied another 10 per cent, based upon physical capacity of preparation facilities.

New York— Gray iron business is expanding, despite some lag in heavy work, such as in machine tool requirements. Most jobbing shops have not yet reached preholiday levels, although they are operating a five-day week, generally with full working forces. Operations are estimated at around 85 per cent of normal capacity. Backlogs run about six weeks. Iron casting prices are higher, as much as 10 per cent in some cases.

Malleable shops are operating at a high level, probably 95 per cent of normal capacity. Considerable work is coming out for hardware, electrical fittings and small tools. Some



Designed for dielectric furnaces and conventional ovens...

J-M Pallite Plates and Form Driers afford desirable operational advantages

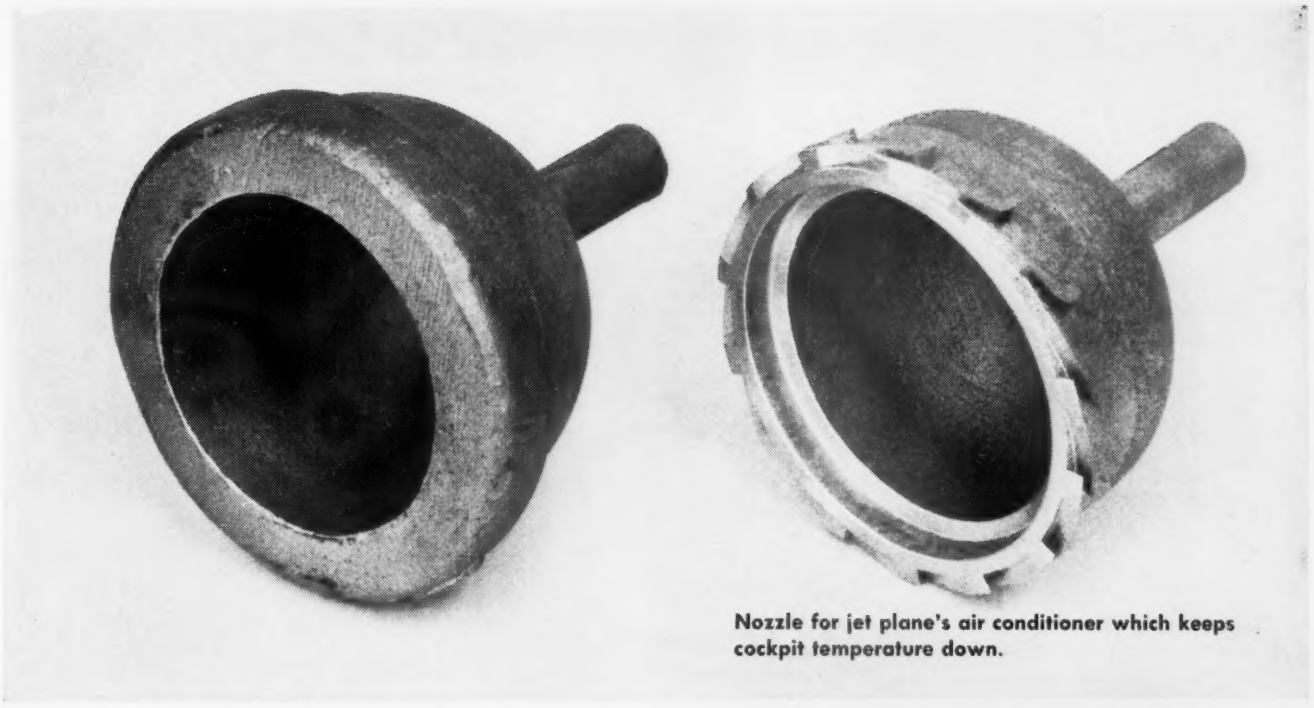
Service records prove that Johns-Manville Pallite outperforms and outlasts many other materials in use in dielectric type furnaces. The advantages of Pallite are due to its special formulation, developed by Johns-Manville for use in dielectric furnace core-drying operations in foundries. Pallite offers the following desirable characteristics:

- light weight
- uniform electrical conductivity
- uniform thermal conductivity
- dimensional stability
- nonsweating
- moisture-absorbent

Pallite Plates are now available in both flat and grooved form. Pallite Form Driers are also available, contoured to support irregular shaped cores properly during their travel through the furnace. For details about J-M Pallite materials, write Johns-Manville, Box 60, New York 16, N. Y. In Canada, Port Credit (Toronto), Ontario.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville PALLITE



Nozzle for jet plane's air conditioner which keeps cockpit temperature down.

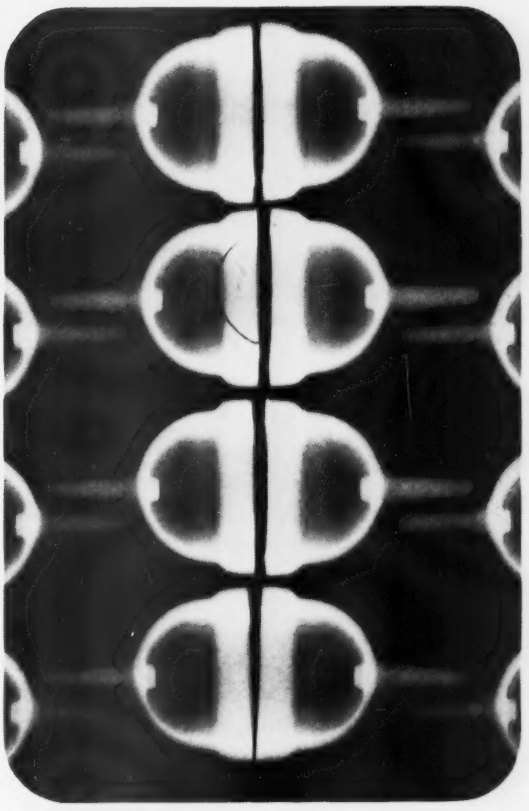
RADIOGRAPHY *says:* "O.K. to Machine"

COMPLEX MACHINING is required to transform this casting into the precision nozzle of a jet plane's air conditioner.

Fourteen intricate, curved vanes are cut in the rough casting's rim. Tolerance is .002 inch. This means plenty of high-cost machine time—which could be a total loss if it is left to the cutting tools to find any defect in the casting.

Radiography avoids that . . . shows up shrink or other faults before machining is begun. Only those castings proved sound are worked. Time and money both are saved.

Easy to see, isn't it, how radiography pays off? And if you would like to know other ways it can help you, like improving yield in production runs, here's a suggestion: Talk it over with your x-ray dealer. Or, if you like, drop us a note saying, "Send me a free copy of Radiography as a Foundry Tool."



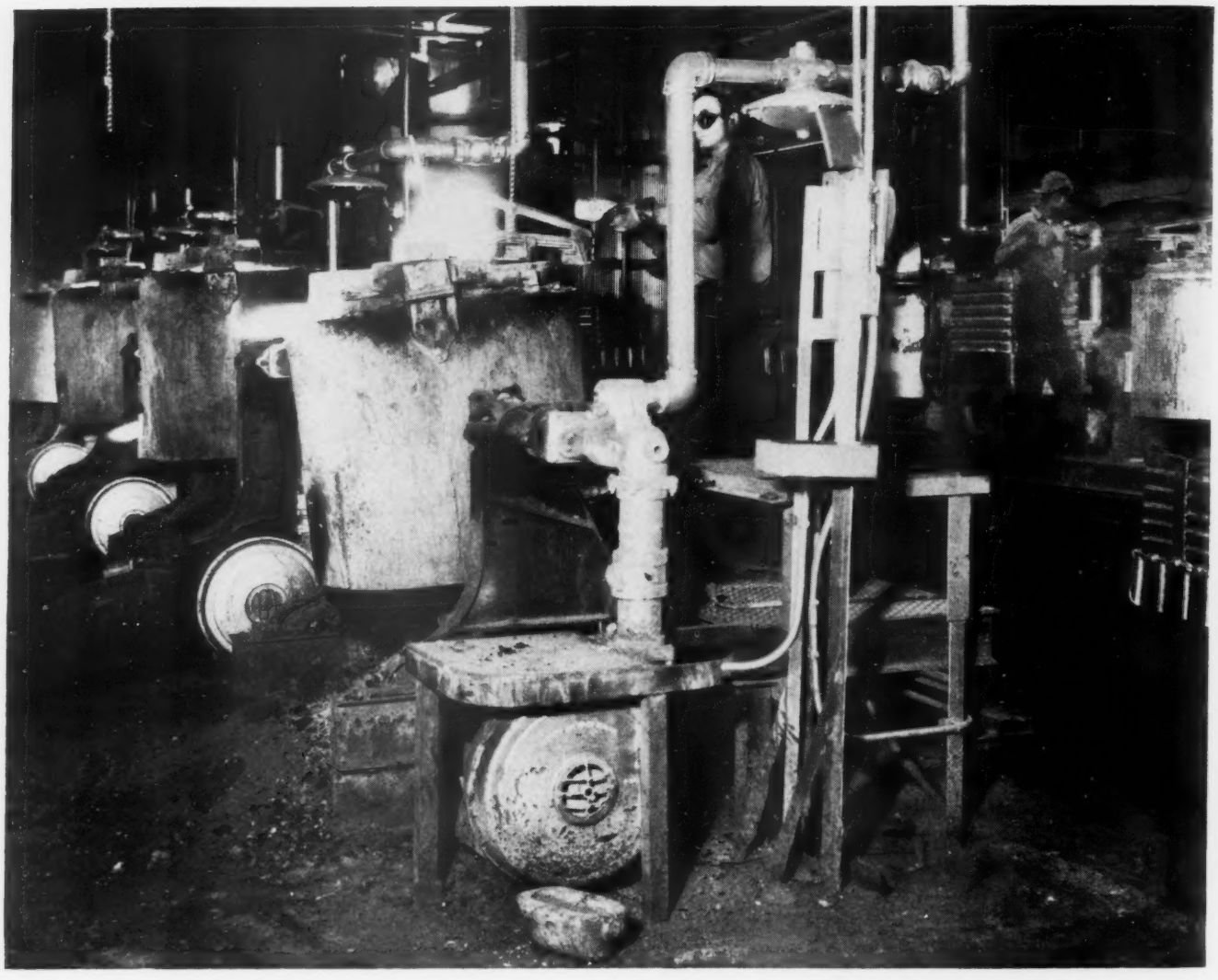
Radiograph shows castings with "shrink"—saves costly machining time.

EASTMAN KODAK COMPANY
X-ray Division
Rochester 4, N.Y.

Radiography . . .

another important example of Photography at Work.

Kodak
TRADE-MARK



Schaible Company finds Blowers that can take it

The air in this typical production foundry is full of sand and dirt—but North American blowers, designed for heavy duty, give constant pressure year-in and year-out, even on these really tough jobs. Foundry success depends on steady operation—steady blower operation.

All 18 Campbell-Hausfeld tilting crucible furnaces in this brass foundry use:
North American No. 300 Turbo Blowers
North American No. 65 Aspirator Mixers
North American
No. 18 Atmospheric Regulators
North American No. 25 Butterfly Air Valves

For Better Blowers – Buy North American

NORTH AMERICAN COMBUSTION since 1917

the NORTH AMERICAN mfg co
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MELTRITE PIG IRON

Strictly Merchant

Great productive capacity. Entire production for sale at all times. Strategic location of the five plants. Quality of product. These are but four reasons why *more* MELTRITE is used than any other merchant pig iron.

MELTRITE is made to the required analysis for the particular need. Specifications are met for many different grades.

SERVICE DEPARTMENT AVAILABLE WITHOUT OBLIGATION

Five favorably located plants in Erie, Toledo, Chicago, Duluth.

Serving Industry Since 1883

PM

PICKANDS MATHER & CO.
CLEVELAND 14, OHIO
Chicago • Cincinnati • Detroit • Duluth
Erie • Greensboro • St. Louis • Washington

IRON ORE • PIG IRON
COAL • COKE • FERROALLOYS

estimate backlogs at six to eight weeks.

Aluminum shops are busy on aircraft work and on components for a miscellaneous assortment of consumer durable goods. Their greatest concern at the moment is shortage of ingots. Brass and bronze shops are doing well, with shipyard requirements being stepped up, especially for the Navy. Bronze castings are in more active demand by the railroads, and valve and pump work is brisk. Meter manufacturers are having to farm out some of their casting requirements. In general, the light metal shops are operating at full capacity and the brass and bronze shops average around 90 per cent.

Increasing shortage of ferrous scrap and the resulting higher prices are forcing the gray iron and malleable foundries to increase the ratio of pig iron in their melts. Red metal scrap continues scarce, but is not quite as tight as prior to the turn of the year.

Los Angeles—Foundrymen who entered 1956 with unbounded optimism haven't lost their cheerful attitude in spite of a slackening in business in January. Most foundrymen attribute the slight letdown to the usual year-end slack, aggravated by two consecutive three-day holiday weekends. Several large consumers of castings shut down all operations entirely over the holidays; many others operated at considerably less than peak capacity.

Most significant trend in the foundry business continues to be the decided swing toward more commercial orders. One steel foundry, without a single commercial project 18 months ago, now devotes more than 60 per cent of its production to nonmilitary work. Despite the tendency to go after commercial business, foundries are not neglecting defense projects, which are still plentiful although in lesser quantities than in previous years.

Foundries are buying considerable scrap, and paying near record prices for it. No. 1 cupola cast has sold for $48, or $5 more than in October, and the upward spiral of cast prices shows little sign of abating.

Considerable trade interest has been expressed in contract awarded Harvill Corp., the West's largest die casting firm. Under a contract in excess of $250,000, Harvill will produce magnesium and aluminum die casting for the guidance system for the Terrier missile. The split con-

MILWAUKEE COKE SOLVAY

Highest Quality Foundry Coke

MILWAUKEE SOLVAY is highest quality coke—and has been for over 50 years—because it is made only from carefully selected coal purchased for one reason—to make the *best* foundry coke.

Resistant to shatter and abrasion, high in carbon and low in sulphur and ash, MILWAUKEE SOLVAY is screened to the correct size for your requirements. It is always in dependable supply.

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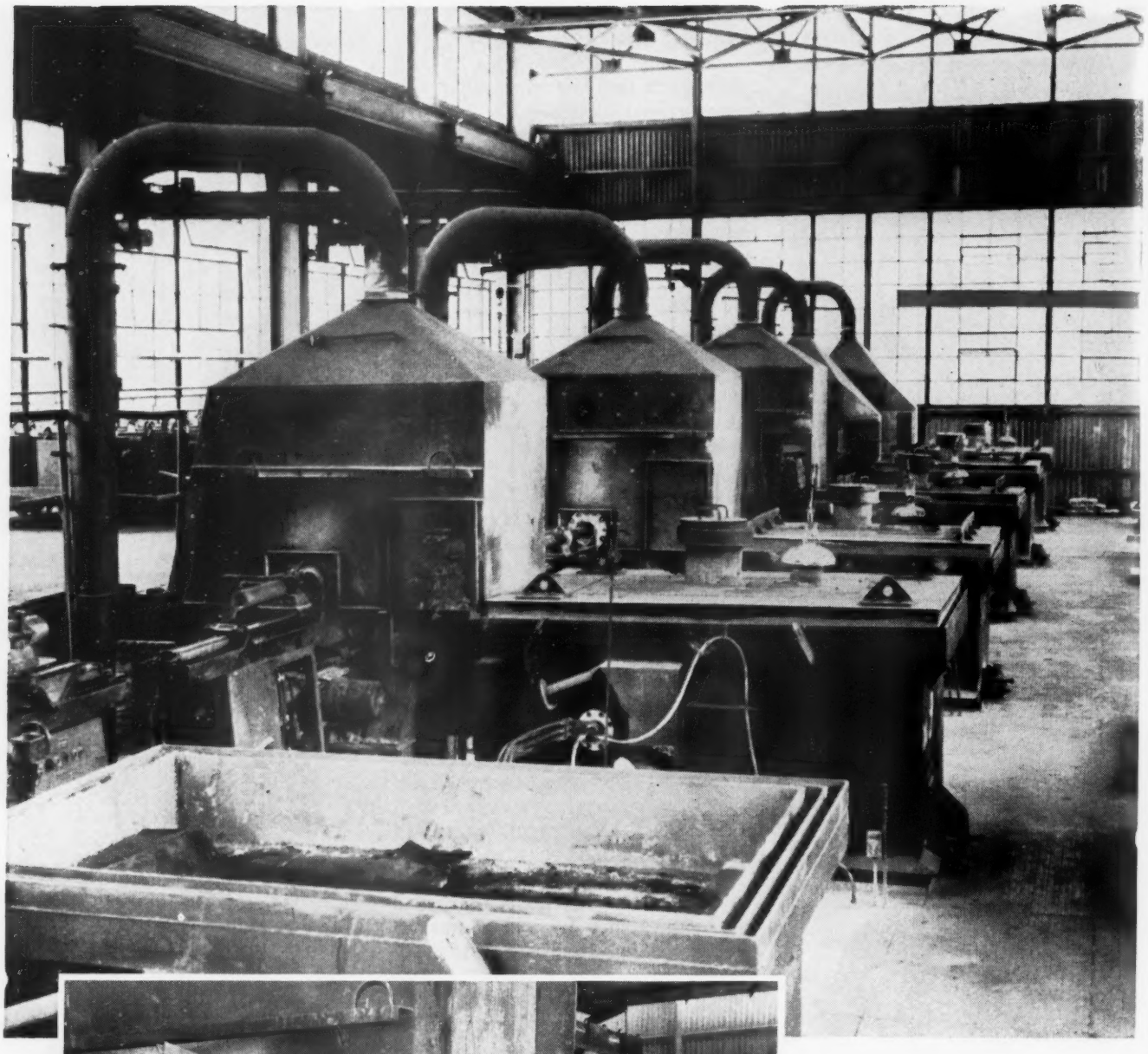
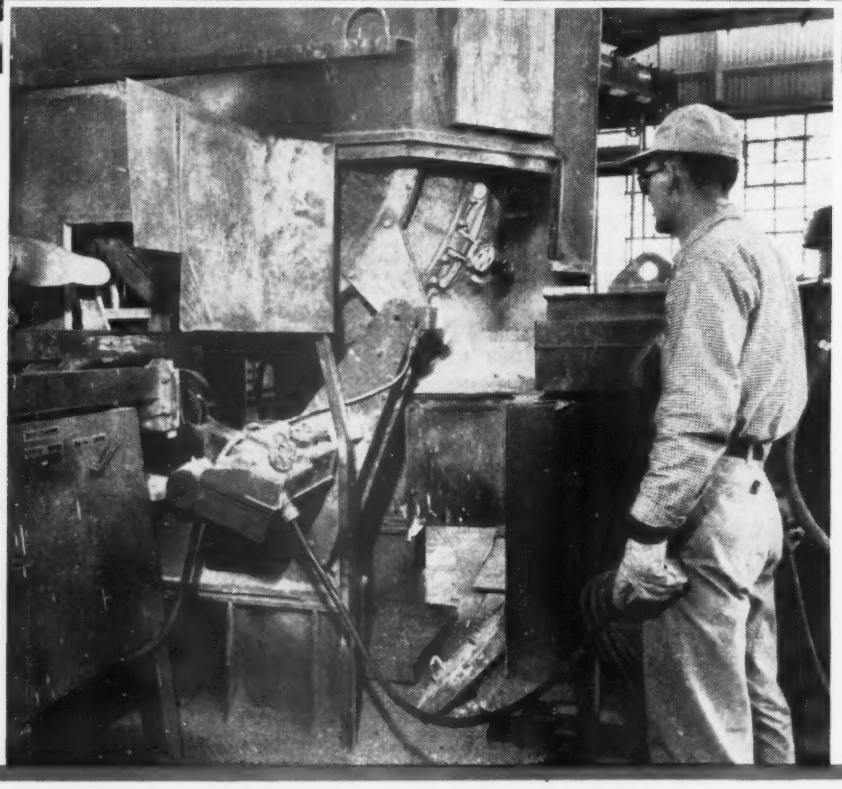




A view of the ASARCO furnace floor, showing some of the Detroit furnaces used in continuous casting.

A melt being poured from a Detroit Rocking Electric Furnace into its receiving box.

DETROIT

Metal for CONTINUOUS CASTING at ASARCO is melted in Detroit ROCKING Electric Furnaces

In the revolutionary method of continuous casting bronze alloys at ASARCO, an uninterrupted flow of molten metal is essential. Five 4-story-high vertical production lines operate around the clock, with molten material entering the top and the solidified product, in lengths up to 16 feet and diameters up to 9 inches, delivered at the bottom.

To do the melting, ASARCO uses a battery of Detroit Rocking Electric Furnaces. Raw material is supplied to these furnaces in an almost constant stream. The furnaces are built for lip-tilting and melts are poured into receiving boxes connected to the furnaces. From these boxes the metal flows to the casting furnace and then out through water-cooled graphite dies.

• • •

The qualities that led American Smelting and Refining Company to select Detroit Electric Furnaces for this application will also recommend them to you.

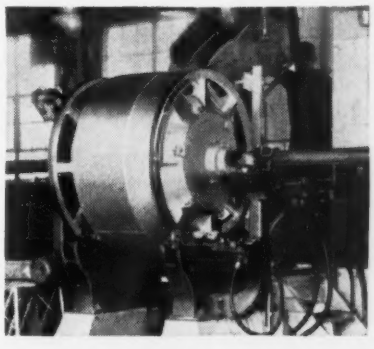
HIGH PRODUCTION—The indirect arc, operating inside the enclosed furnace, generates high heat quickly. Melts are brought to desired temperature in almost exactly the same elapsed time through cycle after cycle—a very important characteristic when production is geared to the metal supply.

POSITIVE QUALITY CONTROL—Metallurgical control is simple and positive with Detroit Rocking Electric Furnaces. The electrodes are free of the bath at all times, so carbon pickup is eliminated. Superheating to get high physicals is easily done.

EFFICIENT, LOW-COST OPERATION—Rocking action washes molten metal over the refractory, picking up heat otherwise wasted. Design and functioning of the furnace assures optimum power utilization. And there's less metal shrinkage in a Detroit!

AUTOMATIC—Rocking action is automatically controlled. Any desired angle of initial rock can be set for any desired length of time. Then the rock will increase to full rock (140°) in another desired time. Thus the most efficient cycle can be automatically duplicated all day long. Electrode controls are also automatic, to furnish fastest melting speed with lowest power consumption.

Investigate Detroit Rocking Electric Furnaces for your metal melting operations. For ferrous and non-ferrous metals and alloys. Capacities from 10 to 10,000 pounds. Write, outlining your requirements, for specific information.

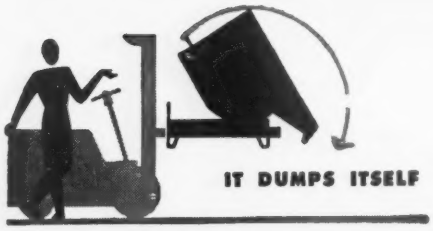


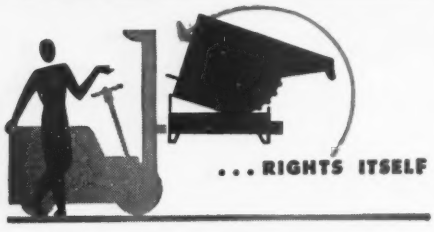
DEF Type LFY, 175 K.W., 700-lb. capacity.

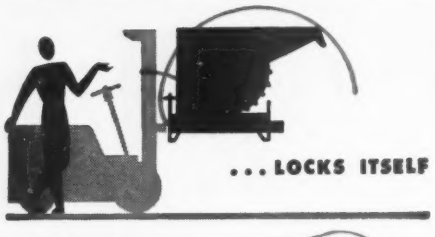
ELECTRIC FURNACE DIVISION

Kuhlman Electric Company • Bay City, Michigan

Foreign Representatives: in BRAZIL—Equipamentos Industrias, "Eisa" Ltd., Sao Paulo; CHILE, ARGENTINA, PERU and VENEZUELA: M. Castellvi Inc., 150 Broadway, New York 7, N. Y.; MEXICO: Cia Proveedora de Industrias, Atenas 32-13, Apartado 27A3, Mexico 6, D. F., Mexico; EUROPE, ENGLAND: Birlec, Ltd., Birmingham.







...and dares you to damage it.

This is no ordinary hopper. It's a Roura hopper. And Roura makes 'em rugged. It takes on the toughest assignments . . . day in and day out . . . and comes back for more. Even the crash-bang handling of careless lift truck operators doesn't bother a Roura for it's built of extra heavy metal . . . welded with care . . . braced and double-braced . . . for years of trouble-free service.

Your Roura Self-Dumping Hopper will cut hand-unloading costs at least 50% . . . pay for itself before you know it. Available in sizes from ½ to 2 cubic yards for use with fork or platform lift trucks, mounted on live skids or with malleable or rubber tired casters.

ROURA *Self-Dumping* **HOPPER**

HERE'S HOW to get more details about Roura Self-Dumping Hoppers. Just attach this coupon to your letterhead . . . sign your name . . . and mail to . . .

ROURA IRON WORKS, INC.
1421 Woodland Ave., Detroit 11, Michigan

tract, shared by Motorola Research Laboratories and Convair Division of General Dynamics Corp., is said to be the largest ever placed with a die casting firm for missile work.

Pittsburgh— In analyzing the 1956 market for foundry equipment, Thomas Kaveny Jr., president, Herman Pneumatic Machine Co., reports, "Outlook for equipment sales is excellent. Our backlog is at record levels for a peacetime period."

Suppliers to foundries here often report that increases in purchases of equipment follow improvements in foundry activity by six months to a year. Now foundrymen are sufficiently optimistic about business prospects to invest in new machinery.

A producer of sand preparation equipment in the Pittsburgh area reports it is well booked to May 1. That firm expects the present rising rate of inquiries to develop into more new orders in spring.

The average order backlog in gray iron foundries is about three months. Most foundries in the district have bright prospects for this year.

Philadelphia— Gray iron business is brisk. Most shops are operating at close to 100 per cent of normal. Backlogs average at least seven weeks, with some producers booked solidly ahead for two months.

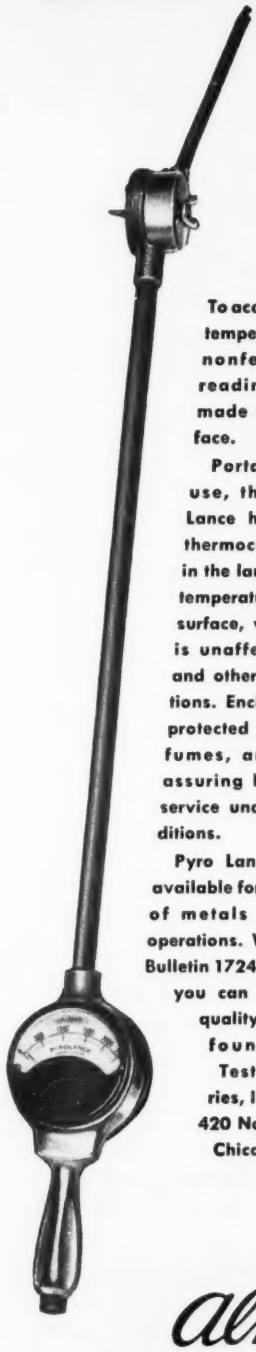
Reflecting an active market, as well as higher costs, various gray iron shops have marked up prices about 10 per cent.

Gray iron business is diversified. Improvement is noted in requirements of the paper and textile machinery builders. Die work has slowed down a bit, due primarily to the fact that foundries have had to wait on the pattern shops.

District steel foundries are not too busy. Most are operating on a five-day week. But some do not appear to be operating at better than 80 per cent of normal, and their backlogs are not too extended, ranging possibly around four to six weeks. The relatively limited malleable capacity in this district is fully engaged. Demand for hardware and pipe fittings is active; also there is good inquiry from truck manufacturers. Backlogs are estimated at around seven to nine weeks.

Light metal shops reflect the expanding activity in aircraft work. Full operations, with overtime, are the rule. Bronze and brass foundries are averaging around 90 per cent of normal, with inquiry diversified.

in nonferrous foundries SURFACE INDICATIONS CAN BE MISLEADING



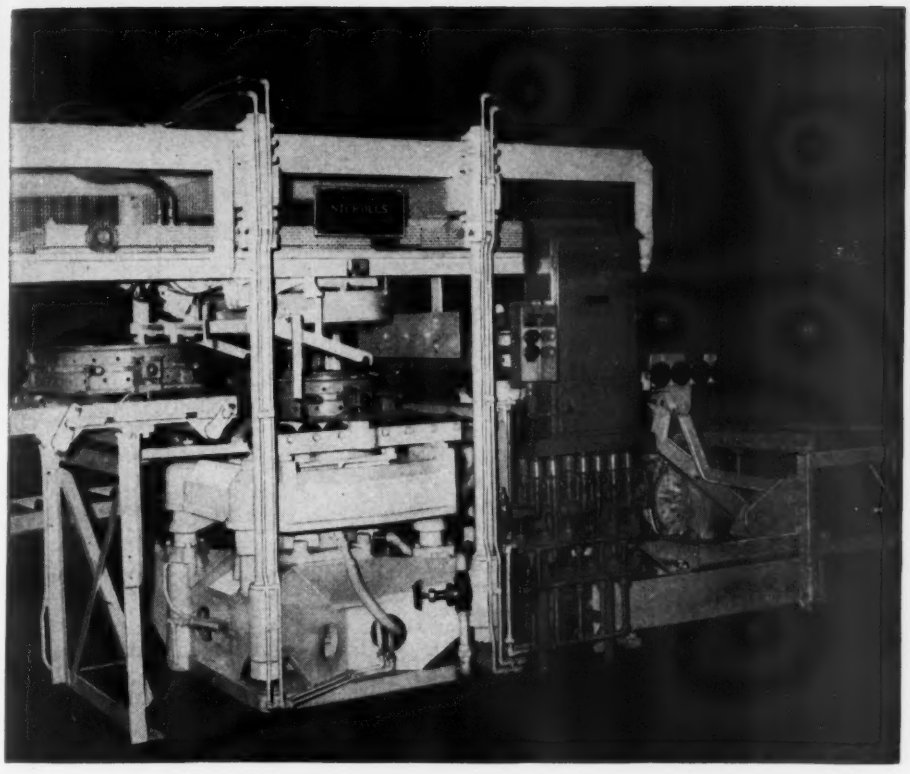
To accurately measure temperature of molten, nonferrous metals, readings should be made *below* the surface.

Portable, handy to use, the Alnor Pyro Lance has a protected thermocouple mounted in the lance tip—it takes temperatures below the surface, where accuracy is unaffected by dross and other surface conditions. Enclosed couple is protected against flame, fumes, and corrosion, assuring long, accurate service under severe conditions.

Pyro Lance models are available for a wide variety of metals and foundry operations. Write today for Bulletin 1724-D and see how you can have low-cost quality control in your foundry. Illinois Testing Laboratories, Inc., Room 511, 420 North LaSalle St., Chicago 10, Illinois.

Alnor

PRECISION INSTRUMENTS FOR EVERY INDUSTRY



No. 21 Type C. F.—Jolt, Squeeze and Pattern Draw — Automatic - Push Button Control

(Also Made in Smaller and Larger Sizes)

New "Push-Button" Operation Takes The Guesswork Out of Molding

From start to finished mold, the Nicholls #21 Type CF Jolt, Squeeze and Pattern Draw Molding Machine is push-button controlled to eliminate dangerous risks, costly mistakes—to give you better molds *continuously*. Precision built for long years of service . . . made with all the safety-devices, the hidden "quality points" that reduce maintenance costs . . . the know-how that almost half a century of building quality molding machines has made possible. If you're interested in better quality molds at lower cost—investigate these machines now.

For complete information, write to:

William H. Nicholls Co., Inc.

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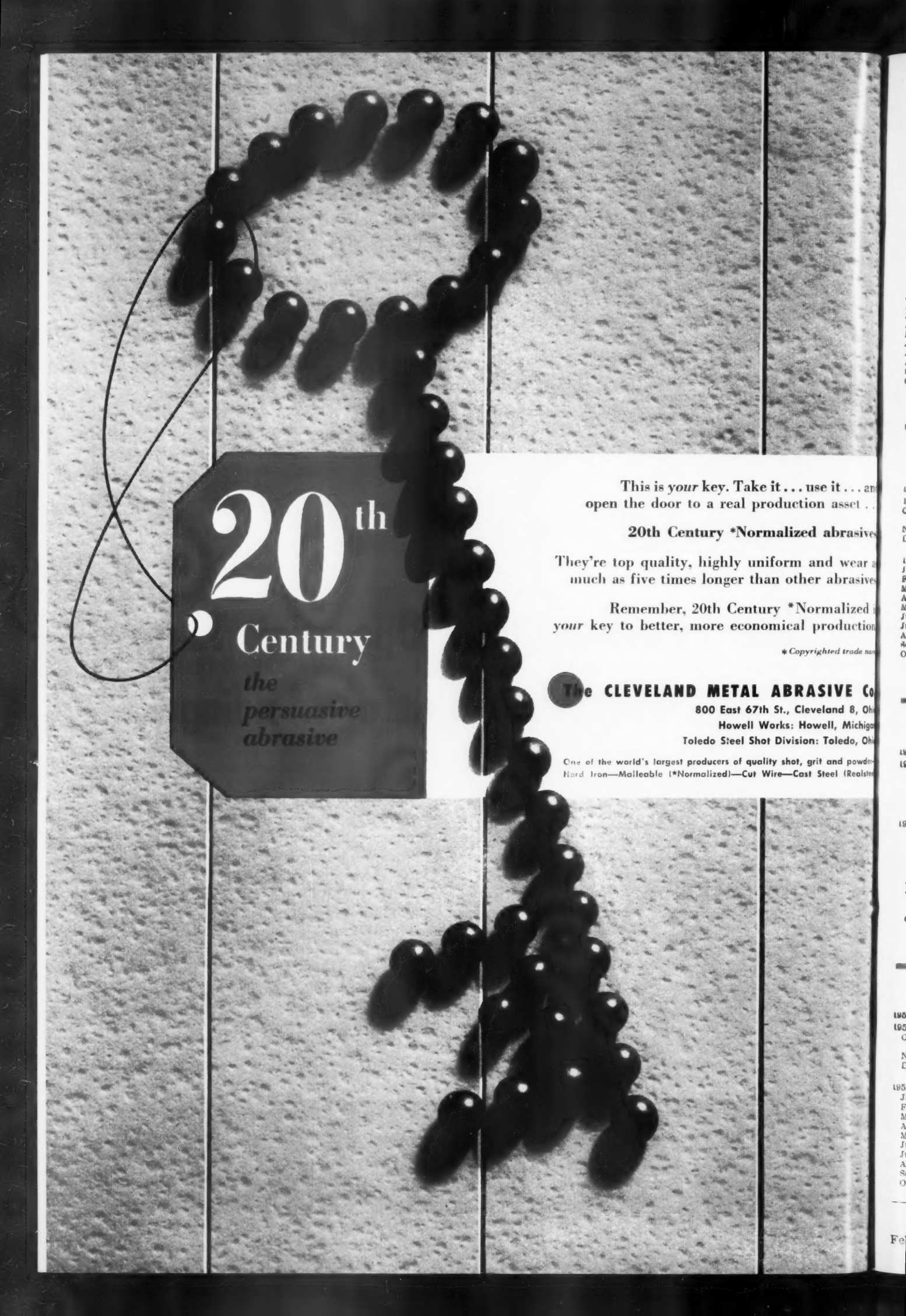
NICHOLLS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Foundry Statistics

MALLEABLE IRON

(Shipments of castings—net tons[1])

	Shipments		Unfilled Orders[2]
	Total	For Sale	
1953	970,506	578,749	.....
1954			
Oct.	64,321	36,956	71,090
10 mo.	671,387	371,368	.....
Nov.	70,030	41,609	80,686
Dec.	80,599	49,005	85,064
Total	812,016	461,982	.....
1955			
Jan.	82,028	48,000	99,817
Feb.	85,979	48,721	101,766
Mar.	102,364	60,063	99,730
Apr.	101,226	57,397	104,091
May	98,397	57,317	106,446
June	99,456	60,261	107,559
July	75,570	44,914	115,420
Aug.	82,448	48,126	123,473
Sept.	87,215	55,471	116,636
Oct.	90,866	53,804	121,261
10 mo.	905,549	534,074	.....

ALUMINUM

(Shipments of castings—1000 pounds[1])

	Shipments				Unfilled Orders[2]
	Total	Sand	Perm. Mold	Die	
1953	658,022	214,553	200,025	239,330	.....
1954					
Oct.	54,903	12,765	19,238	22,247	88,518
10 mo.	504,862	131,786	166,983	197,137	.....
Nov.	56,066	12,934	20,396	22,137	94,491
Dec.	64,045	13,753	23,629	26,017	99,556
Total	624,973	158,473	214,408	245,291	.....
1955					
Jan.	64,414	13,358	23,679	26,819	102,382
Feb.	66,869	13,579	24,319	28,234	108,939
Mar.	78,958	16,019	29,029	33,229	110,046
Apr.	73,049	14,041	28,028	30,208	109,156
May	71,691	14,235	25,597	31,243	104,984
June	68,473	14,920	24,682	27,939	102,799
July	55,033	11,716	21,006	21,656	101,024
Aug.	64,864	14,916	22,267	27,004	105,994
Sept.	67,069	14,769	23,075	28,532	111,696
Oct.	72,197	14,485	25,135	31,741	120,222
10 mo.	682,617	142,038	246,817	286,605	.....

COPPER-BASE ALLOY

(Shipments of castings—1000 pounds[1])

	Shipments			Unfilled Orders[2]
	Total	Sand	Perm. Mold	
1953	990,496	888,369	61,316	.....
1954				
Oct.	70,276	63,855	3,619	30,396
10 mo.	693,489	624,955	40,413	.....
Nov.	70,020	63,065	4,089	27,608
Dec.	72,421	65,159	4,346	32,054
Total	835,930	753,179	48,848	.....
1955				
Jan.	72,233	64,540	4,678	30,864
Feb.	75,253	67,768	4,598	37,520
Mar.	92,149	83,149	5,649	42,940
Apr.	84,183	75,903	5,152	51,111
May	85,008	76,064	5,513	49,198
June	90,476	80,869	5,840	45,820
July	65,816	59,138	3,998	48,085
Aug.	87,206	77,721	5,322	51,251
Sept.	89,600	80,481	5,603	57,313
Oct.	91,192	82,958	4,513	56,751
10 mo.	833,116	748,591	70,026	.....

MAGNESIUM

(Shipments of castings—1000 pounds[1])

	Shipments		Unfilled Orders[2]
	Total	For Sale	
1953	34,517	31,469	.....
1954			
Oct.	2,092	1,876	7,294
10 mo.	21,329	19,013	.....
Nov.	2,161	1,906	6,867
Dec.	2,287	1,906	6,678
Total	25,777	22,950	.....
1955			
Jan.	2,305	2,067	7,236
Feb.	2,160	2,009	7,376
Mar.	2,572	2,311	7,011
Apr.	2,633	2,405	6,800
May	2,399	2,174	6,550
June	2,367	2,098	6,346
July	1,920	1,763	5,912
Aug.	2,176	2,002	5,964
Sept.	2,478	2,260	5,670
Oct.	2,302	2,077	5,394
10 mo.	23,312	21,166	.....

PRODUCTION WORKERS

Estimated Number
(Thousands)

	Oct. 1955	Sept. 1955	Oct. 1954
Ferrous	223,000	218,900	179,200
Nonferrous	74,200	72,100	62,700

Average Weekly Earnings

Gray Iron	87.33	85.45	75.05
Malleable Iron	82.82	84.65	77.02
Steel	93.95	91.15	76.00
Nonferrous	91.57	87.56	84.25

Average Weekly Hours

Gray Iron	42.6	42.3	39.5
Malleable Iron	41.0	41.7	39.7
Steel	42.9	42.2	38.0
Nonferrous	42.2	41.3	40.9

Labor Turnover Rate (Oct.)
(Per 100 employees)

	Total Accession	Total Separation	Quit	Layoff
Gray Iron	4.3	3.6	2.0	0.8
Malleable Iron	4.5	4.1	2.0	1.2
Steel	4.5	3.0	1.7	0.5
Nonferrous	5.6	3.4	2.2	0.6

Source: Bureau of Labor Statistics

GRAY IRON CASTINGS—SHIPMENTS (Net Tons[1])

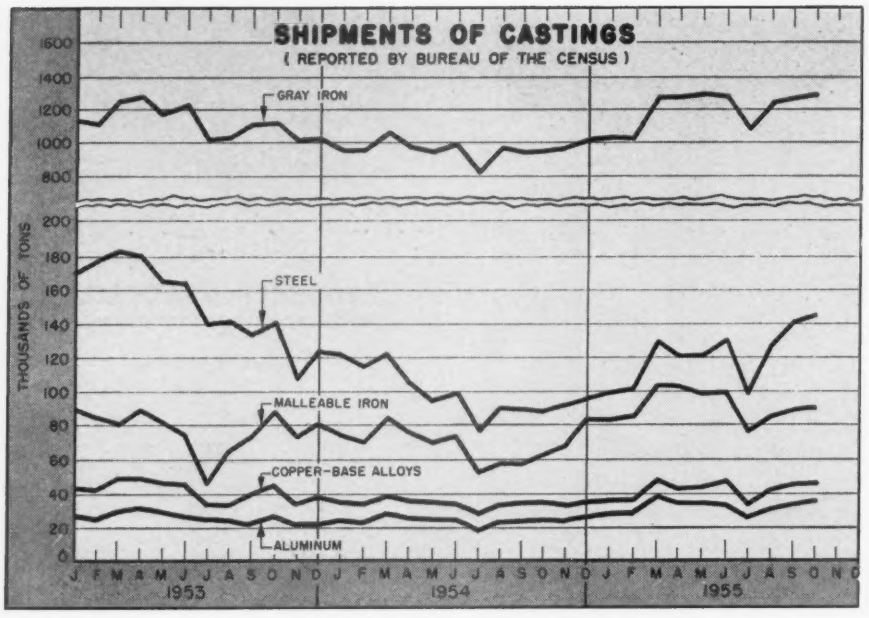
	All Castings		Miscellaneous Castings		Heavy Steel Ingot Molds		Chilled Railroad Car Wheels	Pressure Pipe & Fittings	Soil Pipe & Fittings	Unfilled Orders[2]
	Total	For Sale	Total	For Sale	Total	For Sale	Total	Total[3]	Total[3]	
1953	13,707,902	7,494,843	8,449,837	3,675,454	2,829,159	1,389,483	467,142	1,285,598	677,166	.....
1954										
Oct.	942,934	552,022	570,365	253,802	150,282	79,191	23,599	130,326	68,362	789,117
10 mo.	9,460,596	5,211,843	5,988,202	2,529,908	1,416,598	660,260	282,907	1,147,109	662,793	.....
Nov.	997,301	547,447	623,390	258,933	167,983	85,703	25,723	118,480	61,725	759,613
Dec.	1,074,258	563,699	680,700	276,045	200,004	97,936	27,229	111,082	55,203	744,633
Total	11,532,158	6,322,989	7,292,292	3,064,886	1,784,625	843,899	325,859	1,376,671	743,721	.....
1955										
Jan.	1,091,923	563,153	712,097	282,386	192,132	97,007	25,783	100,638	61,273	782,656
Feb.	1,106,165	578,171	720,304	291,675	196,118	99,794	27,401	95,285	67,057	852,168
Mar.	1,314,918	688,733	847,874	334,287	217,571	109,681	36,732	129,746	82,995	934,224
Apr.	1,293,678	679,867	819,872	319,149	216,116	108,490	35,415	145,871	76,404	966,057
May	1,310,424	707,105	803,897	315,072	227,236	117,915	35,966	168,772	74,553	937,949
June	1,296,196	715,862	793,067	327,520	228,044	117,727	43,807	147,351	83,927	981,918
July	1,069,711	579,122	634,869	246,297	210,130	112,137	28,181	129,191	67,340	1,049,565
Aug.	1,226,312	688,317	718,423	301,502	238,007	121,071	29,298	156,074	84,510	1,160,466
Sept.	1,252,736	712,688	731,073	314,223	244,199	124,811	29,953	165,332	82,179	1,150,933
Oct.	1,310,309	713,671	795,875	327,827	245,749	122,722	31,877	160,875	75,923	1,113,336
10 mo.	12,272,372	6,626,689	7,577,351	3,059,938	2,215,302	1,131,355	324,413	1,399,135	756,204	.....

STEEL CASTINGS—SHIPMENTS (Net Tons[1])

	All Castings			Carbon			Alloy			Unfilled Orders[2]
	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	
1953	1,834,197	1,400,013	321,010	1,276,729	959,493	293,491	557,468	417,148	27,519	.....
1954										
Oct.	87,085	64,004	8,580	56,705	39,872	7,596	30,380	24,132	984	154,079
10 mo.	1,002,890	745,503	115,850	683 797	494,757	103,216	319.103	251,490	12,952	.....
Nov.	87,659	64,812	7,742	56,057	40,085	6,624	31,602	24,727	1,118	175,715
Dec.	93,547	69,843	12,489	62 967	45.632	10,469	30.841	24.211	1,245	179,148
Total	1,184,096	880,158	135,581	802,321	580,474	120,309	381,285	303,428	15,315	.....
1955										
Jan.	98.238	75,044	13,809	67.307	49,816	12,762	30.841	25,228	1,047	201,839
Feb.	106,430	80.729	16 501	74,709	55,014	15,381	38.945	25.715	1,120	202,301
Mar.	127,460	98,926	19.339	88.867	68,013	17,887	34.933	30,913	1,452	215,059
Apr.	120,053	92,237	16.646	84,247	63,244	15,163	35.806	28.993	1,483	221.336
May	122,465	92,713	16.810	85,950	63,182	15,335	36.515	29.531	1,475	225,302
June	133,887	102,457	19.591	93,417	69,986	17,979	40.470	32 471	1,612	251,416
July	97,875	71.170	11.631	68.094	48,140	10,666	29.781	23,030	965	354,628
Aug.	126,406	96,290	20.576	91.245	68,514	19,094	35.161	27,776	1,482	413,531
Sept.	140,843	107,622	23.594	100.775	76.156	21,991	40 068	31,466	1,603	420,616
Oct.	145,674	110,409	23.745	105.345	79,235	22.375	40,329	31,831	1,370	418,063
10 mo.	1,219,331	927,597	182,242	859,956	641,300	168,633	362,849	286,954	13,609	.....

[1]Source: Bureau of Census. [2]For sale only. [3]All cast iron pipe is shipped for sale.

FOUNDRY STATISTICS



COMMERCIAL HEAT TREATING

(National Billings of Metal Institute Members)

	1953		1954		1955	
	No. Reporting	Total Reported	No. Reporting	Total Reported	No. Reporting	Total Reported
Aug.	60	2,452,186	62	1,801,659	64	2,439,300
Sept.	57	2,522,127	63	1,853,665	63	2,581,000
Oct.	59	2,782,219	63	1,891,100	63	2,785,100
Nov.	59	2,493,497	63	1,932,700	63	2,809,100
11 mo.		29,540,661		22,533,000		26,814,600
Annual total		31,733,067		24,244,368		21,219,880

COKE PRODUCTION AND CONSUMPTION

(Net tons)

	Production	Consumption Total	Consumption By Foundries
1953	78,467,806	78,227,414	2,915,420
1954			
Oct.	5,082,374	5,100,135	208,418
10 mo.	48,685,922	48,240,015	2,041,431
Nov.	5,230,237	5,283,916	221,391
Dec.	5,610,564	5,615,228	217,104
Total	59,526,723	59,139,159	2,479,926
1955			
Jan.	5,805,926	5,862,113	234,784
Feb.	5,394,166	5,519,241	242,282
Mar.	6,235,909	6,306,723	286,072
Apr.	6,135,645	6,164,459	278,242
May	6,426,747	6,570,567	277,967
June	6,148,026	6,297,338	249,525
July	6,169,770	6,266,631	221,372
Aug.	6,395 422	6,439,101	249,425
Sept.	6,397,133	6,501,013	260,608
Oct.	6,631,120	6,814,893	284,088
10 mo.	61,739,864	62,742,079	2,584,365

INGOT BRASS AND BRONZE

(Shipments in net tons)

	1954	1955
Jan.	20,661	25,201
Feb.	19,920	25,349
Mar.	23,653	29,713
Apr.	24,746	27,641
May	22,269	23,708
June	22,348	23,141
July	17,074	18,513
Aug.	21,684	27,013
Sept.	22,464	26,349
Oct.	24,080	25,228
Nov.	23,061	25,102
Dec.	21,273	.....
Total for year	263,233	.....

ZINC-BASE ALLOY

(Shipments of castings—1000 pounds[1])

	Shipments Total	Shipments For Sale	Unfilled Orders[2]
1953	521,253	349,022	.....
1954			
Oct.	42.202	27,337	64,700
10 mo.	414,101	252,427	.....
Nov.	51,990	35,207	62,950
Dec.	54,410	35,211	69,603
Total	520.501	322,845	.....
1955			
Jan.	58,586	35,472	70,691
Feb.	58,585	35,893	73,858
Mar.	71,811	44,048	81,363
Apr.	71,595	45,477	81,756
May	63,735	38,124	74,472
June	66.569	42,753	71,344
July	47,928	27,429	68,927
Aug.	62,677	61,957	75,592
Sept.	62,030	43,498	80,660
Oct.	71,689	46,581	85,489
10 mo.	635,205	421,232	.....

INDEX OF FOUNDRY EQUIP. ORDERS

Foundry Trades Only

(Net Orders Closed, New Equipment)

	1954	1955
Jan.	173.8	81.0
Feb.	99.9	90.4
Mar.	82.7	163.6
Apr.	125.3	178.6
May	80.8	145.7
June	86.4	186.8
July	68.8	213.4
Aug.	75.6	134.0
Sept.	68.3	156.7
Oct.	147.5	108.6
Nov.	61.4	....
Dec.	113.9	....

Note: Figures are percentages of the base period 1947-49 taken as 100 per cent (monthly average). This is a new base period. Source: Foundry Equipment Manufacturers Association.

IRON AND STEEL SCRAP CONSUMPTION

(Gross tons*)

	All Scrap Total	By Types of Furnace: Cupola Total	Air Total	Electric Total
1953	69,005,976	9,676,463	1,026,334	8,263,880
1954				
Sept.	4,298,495	675,593	68,860	500,349
9 mo.	39,993,857	6,296,733	622,775	4,432,491
Oct.	4,782,488	710,127	67,678	528,432
Nov.	4,928,850	737,286	71,844	573,298
Dec.	5,075,563	798,435	82,910	566,223
Total	54,780,758	8,542,581	855,207	6,100,444
1955				
Jan.	5,416,052	813,682	90,622	614,824
Feb.	5,350,452	823,465	91,916	577,296
Mar.	6,313,717	993,266	113,198	727,401
Apr.	6,239,036	975,751	108,965	726,138
May	6,415,947	963,082	109,074	745,060
June	6,117,573	928,908	116,419	733,573
July	5,447,130	730,735	81,216	623,623
Aug.	5,913,031	868,644	101,607	765,343
Sept.	6,060,491	881,158	119,550	753,318
9 mo.	53,273,429	7,978,691	932,567	6,266,576

PIG IRON PRODUCTION AND CONSUMPTION

	Production** (standard grades—net tons) Total	Foundry	Malleable	Basic	Low Phos. Intermediate Low Phos. & Bessemer	Consumption* (By type of furnace—gross tons) Total	Cupola	Air	Electric
1953	74,879,511	2,599,307	3,736,431	60,465,016	8,347,825	66,637,364	4,918,480	272,311	164,267
1954									
Nov.	5,204,446	202,824	263,484	4,233,253	504,885	4,764,215	375,526	16,178	15,932
11 mo.	52,587,204	2,011,719	2,539,223	42,974,275	5,061,987	47,395,341	3,960,692	195,329	141,341
Dec.	5,526,720	229,717	259,423	4,510,772	526,808	4,978,200	403,726	19,829	13,917
Total	58,113,924	2,241,436	2,798,646	47,485,047	5,587,465	52,373,541	4,364,418	215,158	155,258
1955									
Jan.	5,729,404	243,608	272,451	4,703,875	509,470	5,202,360	409,281	18,874	20,016
Feb.	5,394,585	209,852	252,860	4,425,080	506,793	4,964,515	409,141	20,576	22,551
Mar.	6,406,902	221,437	359,413	5,239,116	586,936	5,830,943	480,639	24,066	15,931
Apr.	6,329,927	210,085	305,188	5,068,506	746,148	5,725,258	467,709	21,536	12,857
May	6,753,236	246,661	342,544	5,385,299	788,732	6,044,882	471,657	21,448	20,085
June	6,494,838	238,412	347,631	5,245,861	662,934	5,774,896	454,751	22,871	21,697
July	6,329,393	233,235	344,365	5,116,960	634,833	5,430,550	361,171	16,483	19,535
Aug.	6,529,580	251,459	319,951	5,214,901	743,269	5,769,689	442,532	22,014	25,685
Sept.	6,653,578	252,630	343,919	5,397,134	659,895	5,903,190	445,099	23,340	24,552
Oct.	6,905,280	267,405	315,045	5,647,527	675,303	.....	.....	.....	.....
Nov.	6,636,649	241,727	353,713	5,404,584	636,625	.....	.....	.....	.....
11 mo.	70,163,372	2,616,511	3,557,080	56,848,843	7,140,938	.....	.....	.....	.....

*Source: U. S. Dept. of Interior. Bureau of Mines. **Source: American Iron & Steel Institute. [1]Source: Bureau of the Census. [2]For sale only.

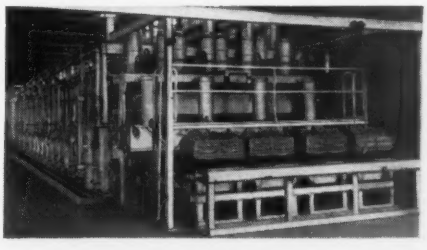
How to Select the Most Economical Insulating Firebrick

The advantages of lightweight insulating firebrick over ordinary "heavyweight" firebrick are generally known to furnace operators and furnace builders. But many buyers have wondered just what advantages there might be in one brand of insulating firebrick as against another. The answer to this question could very well mean savings in fuel costs, increased furnace output, longer life . . . or all three.

One furnace builder ran tests on their small electric kilns where heat input could be measured with great accuracy. Here's what they found: B&W IFB required 25% less heat than any other brand of insulating firebrick they tried.

The reason? B&W IFB are lighter in weight than any other insulating firebrick — they contain more tiny, insulating air cells. Heavier, denser insulating firebrick linings waste fuel two ways: They soak up and store more heat which is lost when the furnace is cooled; and they conduct more heat through the walls.

How about long life? One of the

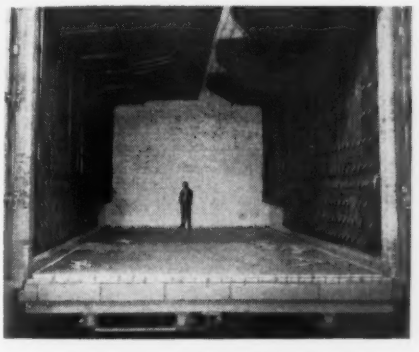


toughest tests of firebrick is in the lining of a carbon monoxide furnace. Some brands last only a few weeks, then disintegrate, due to iron oxide impurities in the brick which react with the gas.

But B&W Insulating Firebrick contain little iron oxide, and they're processed at high temperatures so that any traces of iron oxide form stable compounds. So instead of deteriorating they stay on the job year after year —in many cases over 10 years.

Another factor, important to many furnace operators, is accurate temperature control. Here again B&W IFB have an advantage over other insulating firebrick. First, because B&W IFB are lighter in weight they store and conduct less heat—and they respond more quickly to changes in heat input.

A typical example is the giant stress-relieving furnace shown below—sixty feet by twenty-two feet by seventeen feet high. The B&W lining plays a vital part in holding the desired temperature within 5 degrees accuracy!



Next time you buy or specify insulating firebrick, remember that the lightest weight brick of all—B&W—has the highest insulation value, the longest life and the greatest furnace heat controllability.

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★ **GREATER ACCURACY IN ENGINEERING.**

The ELECTRONIC FORMULATION system precisely spaces every interval between grade and structure changes equally along a perfect progression. This gives the Bay State abrasive engineer the industry's most accurate measuring device for recommending wheel specifications that will fit your job best.

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Electronic precision replaces the possibilities of human error in figuring formulas which control the manufacture of every Bay State wheel. This precision makes sure you get the special grinding qualities determined best for your job.

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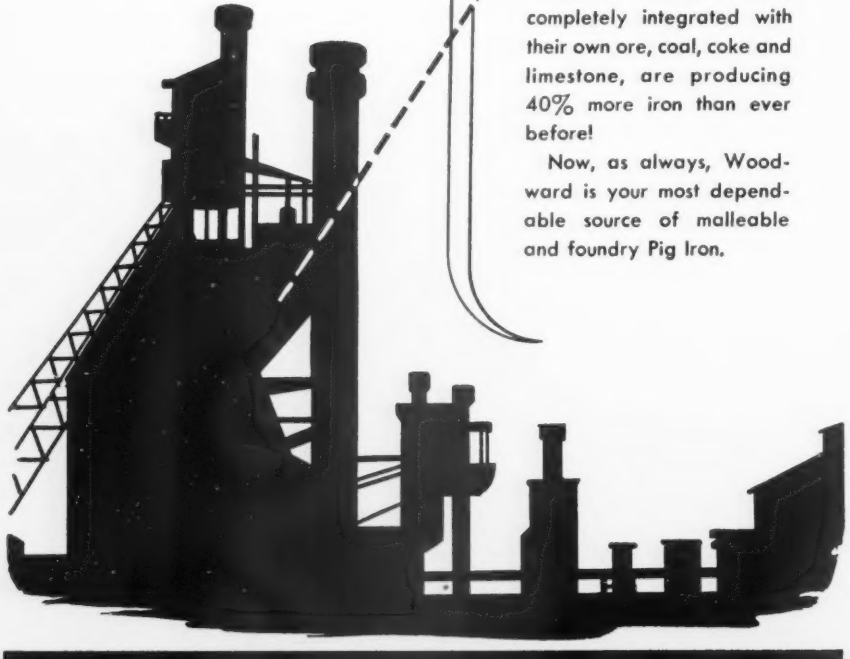

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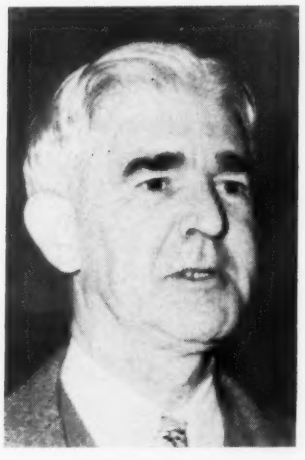
Established 1890

Obituary

CLIFFORD E. BARNETT, 44, production manager, Cleveland Foundry, Ford Motor Co., died Nov. 28, at his home in Berea, O. Mr. Barnett learned foundry operations at International Harvester Co.'s plant in Rock Island, Ill., and after graduation from Augustana College, returned to the company where he spent over 16 years at the Milwaukee, Indianapolis, and Rock Island plants. Prior to joining the Ford foundry in 1950, he was general foundry superintendent, Wilson Foundry & Machine Co., Pontiac, Mich.

James E. Crown, 67, since 1949 production superintendent, U. S. Naval Gun Factory, Washington, died Dec.



JAMES E. CROWN

29. A native of Washington, he obtained his technical training at George Washington University. Associated with the Gun Factory more than 50 years, Mr. Crown began as an apprentice molder, subsequently becoming supervisor and master mechanic. He served as chairman of the Chesapeake Chapter of the AFS in 1942-43.

Frank I. Schmeller, 59, president, Schmeller Aluminum Foundry Co., Cleveland, died Jan. 6. Prior to founding the company 10 years ago, Mr. Schmeller spent 25 years with the former National Bronze & Aluminum Co., Cleveland, where he became general manager.

James J. Trant, 79, retired superintendent of foundries, Pullman-Standard Car Mfg. Co., Chicago, died Dec. 10. Prior to joining the Pullman organization, Mr. Trant was asso-

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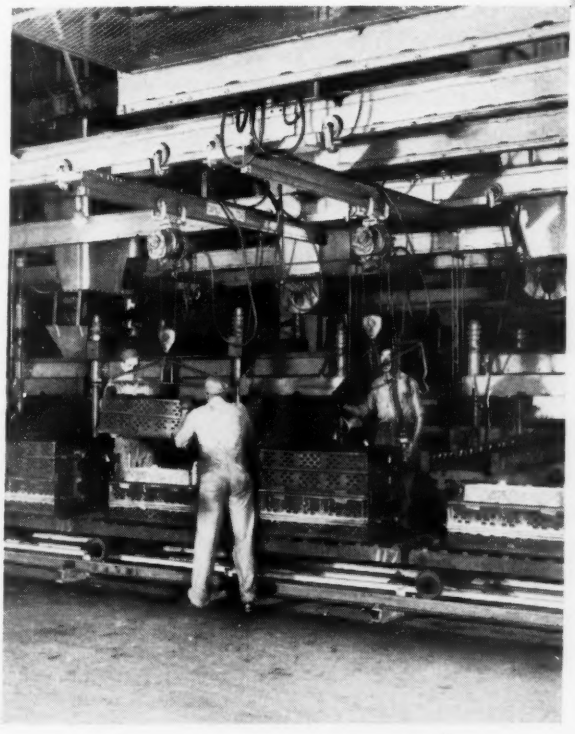

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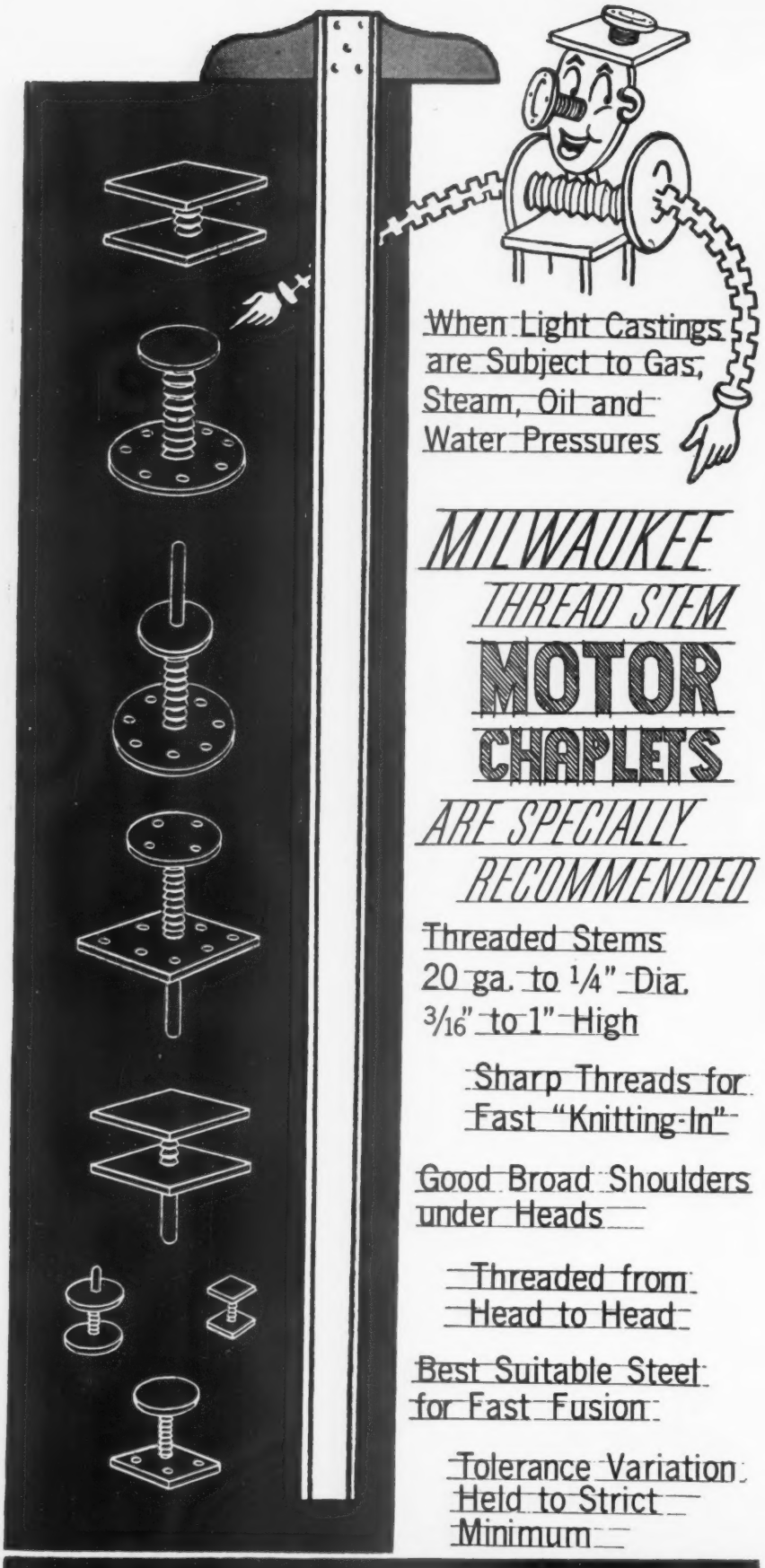
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ciated with Griffin Wheel Co., Chicago, as superintendent of its foundries in Detroit, Boston and Chicago.

Fred A. Lange Jr., 51, former treasurer, Crucible Steel Casting Co., Milwaukee, died Jan. 2. Mr. Lange was manager of the W. R. W. Co., Port Washington, Wis., until it closed a year ago and recently was associated with Eder Mfg. Co., Milwaukee.

Harold Thomas, former owner, Thomas Foundry Inc., Syracuse, N. Y., died Jan. 6. A native of England, Mr. Thomas came to this country in 1909. He spent 8 years with Lamson Corp., Syracuse, prior to establishment of his own brass foundry in 1925.

Richard Ruemelin Sr., 78, founder and president, Ruemelin Mfg. Co., Milwaukee, died Dec. 26. Mr. Ruemelin started the sand blasting and dust control equipment company in Minneapolis in 1921. In 1929 it was moved to Milwaukee.

Harry E. Spieth, 69, retired manager, Western Steel Casting Co., Seattle, with branches at Portland, Oreg., and Tacoma, Wash., died Jan. 1. A resident of Portland for 30 years, he had been living in Tacoma for the past 4½ years.

Clarence R. Schassberger, 60, chief inspector, Pressure Castings Inc., Cleveland, died Jan. 3. He had been associated with the company for 18 years.

J. E. McBride, 76, for more than 40 years associated with Palmer-Bee Co., Detroit, died Nov. 26. He retired three years ago.

William C. Epstein Sr., 63, general manager, Miami Foundry Co., Miamisburg, O., died Nov. 24.

Book Review

Bibliography on Machinery Foundations; Design, Construction, Vibration Elimination, **ESL Bibliography No. 11, may be purchased from Engineering Societies Library, 29 W. 39th St., New York 18. Price $2.**

A revised list of 175 annotated references to books and articles published from 1924 to 1955 covering theory, design and construction of machinery foundations; specific problems such as heavy machinery foundations on unstable soils and vibration as related to foundations.

The fast, safe wheel for portable grinding!

"X-ray" view of wheel shows pronged anchor bushing and safety ring.

Using a lightweight grinder equipped with a Royalite Hard Shell Cup Wheel to snag a grey iron man-hole cover casting. The combination of this grinder and the safer, smooth-running Royalite Wheel means a better job in less time—with less worker fatigue.

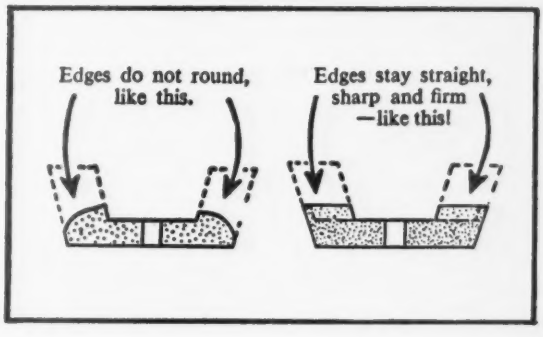
The new

U. S. ROYALITE

HARD SHELL CUP WHEEL

The above cutaway drawing shows the safety secret of U. S. Royalite®: *the pronged anchor bushing and safety ring constitute a reinforcement that makes a safer and a smoother-running cup.* And Royalite's tougher rim keeps the edge sharp for the full life of the wheel. For today's lightweight portable grinders, this is the most economical, most efficient wheel.

EXTRA DIVIDEND: Remember that when you buy wheels from a United States Rubber Company salesman you are dealing *direct* and are being served by a specialist—a man whose only job is selling and *servicing* abrasive wheels. He will see that you get maximum value out of your abrasive wheel dollars.



US RUBBER

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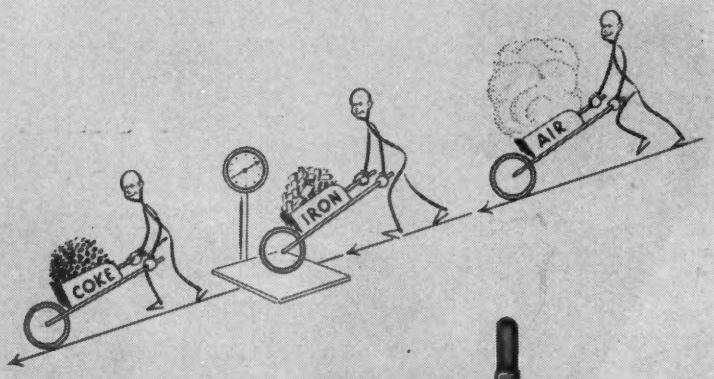
United States Rubber

Foundry costs come down

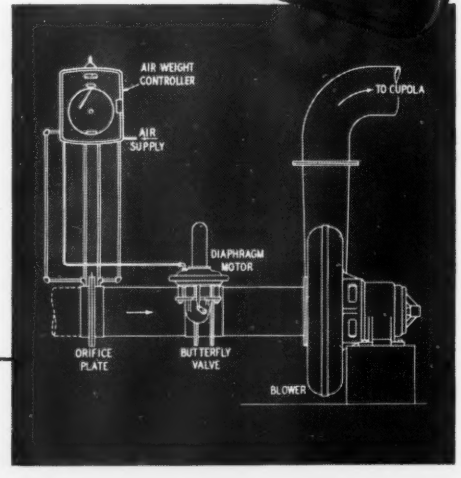


. . . when you weigh air too

Leading foundries report lower fuel costs, fewer rejects, and less pigging after installing Foxboro Air Weight Control. That's because the cupola blast is fully compensated for every change in atmospheric pressure and temperature. *The right amount of oxygen for the quantity of coke charge* insures better combustion, more uniform heats and better quality castings.

Foxboro Air-Weight Controllers automatically control cupola blast by *weight of air* instead of volume. They are one of Foxboro's many original developments in instrumentation to cut industrial costs. Representative installations will be found throughout the foundry industry.

Write for new Bulletin 10-10, "Air Weight Controllers". Also ask the nearby Foxboro Representative to call with recommendations on complete instrumentation for your foundry. **The Foxboro Company, 322 Neponset Ave., Foxboro, Mass., U.S.A.**



Typical installation set-up of Foxboro Air-Weight Control . . . readily adaptable to either a centrifugal blower (shown in diagram) or a positive displacement blower.

FOXBORO REG. U. S. PAT. OFF. **AIR-WEIGHT CONTROLLERS**

Casting Weights from Blueprint Data

(Concluded from January)

Sections F_1 and F_2 constitute the second web or cross member uniting the two ends of the casting. This section is divided in the center by the cylinder E, hence the necessity of estimating separately the content of the two units F_1 and F_2. Section F_1 $\frac{7}{16}$-in. wide and $\frac{1}{4}$-in. thick, measures $1\frac{1}{8}$-in. along one side and $\frac{31}{32}$-in. long the other side, that is along the side of the cylinder E. The intersecting web D cuts $\frac{3}{32}$-in. from each side since D already has been estimated as a continuous member. The length $1\frac{1}{8}-\frac{3}{32}$-in. becomes 0.6875. Result of adding these two lengths and dividing by 2 is 0.7656. Formula for section F_1 then appears as 0.7656 x 0.4375 x 0.25 = 0.083 cu in.

The same procedure is followed in section F_2 where $\frac{3}{32}$-in. is deducted from the two sides which are $\frac{25}{32}$ and $\frac{5}{8}$-in. respectively in length. The result divided by 2 (or multiplied by $\frac{1}{2}$) is 0.4215. Therefore the cubical content of F_2 is 0.4215 x 0.4375 x 0.25 = 0.046 cu in.

Set down in tabular form the result of the various calculations may be grasped more readily:

A — 1.75 × 1.125 × 0.4375		0.862
B — S = 0.75^2 × 196^0 × 0.00873 × 0.4375	0.422	
Minus cb = 0.50 × 1.125 × 0.4375	0.246	0.176
C — 0.625 × 1.00 × 0.25	0.156	
D — 1.375 × 1.25 × 0.25	0.430	
D_1 — Minus 0.50^2 × 0.785 × 0.2813	0.055	0.375
E_1 — 0.1875 × 0.785 × 0.875		0.129
F_1 — 0.7656 × 0.4375 × 0.25		0.083
F_2 — 0.4215 × 0.4374 × 0.25		0.046
Total cubic inches		1.827
Weight cubic inch cast iron		0.26
Estimated weight of casting		0.4750
Plus 10 per cent, fillets, draft, etc.		0.0475
Final estimated weight		0.52 lb

In the previous example the weight of a cubic inch of cast iron was given, and to determine casting weights in other alloys the following may be used:

Red brass, leaded red brass, tin bronze	0.315
Leaded tin bronze	0.335
Yellow brass, leaded yellow brass	0.305
Manganese bronze	0.288
Aluminum bronze	0.270
Aluminum-copper	0.103
Aluminum-silicon	0.096

Specific Gravity and Density of Common Alloys

Casting Alloy	Specific Gravity	Weight per cu in.
Gray Cast Iron	7.14	0.258
Malleable Iron		
ASTM Grade 35018	7.20-7.45	0.260-0.269
ASTM Grade 32510	7.25-7.34	0.262-0.265
Cupola	7.10-7.20	0.256-0.260
Steel		
Low carbon	7.86	0.284
Medium carbon	7.86	0.284
High carbon	7.8-7.86	0.282-0.284
Low alloy	7.8	0.284
High alloy	7.5-8.1	0.271-0.293
Aluminum-base Alloys		
Al-Cu (non-heat treatable)	2.83-2.91	0.102-0.105
Al-Cu (heat treatable)	2.77-2.87	0.100-0.104
Al-Si	2.64-2.71	0.095-0.098
Al-Cu-Si	2.75-2.80	0.099-0.101
Al-Mg	2.64	0.095
Al-Zn	2.80-2.94	0.101-0.106
Al-Si-Cu-Mg-Ni	2.69	0.097
Al-Cu-Mg-Ni	2.75	0.099
Magnesium-base Alloys	1.80	0.065
Zinc-base Alloys	6.7	0.242
High-nickel Alloys	8.7	0.314
Copper-base Alloys		
High-copper	8.8	0.318
Leaded tin bronze	8.89-9.70	0.321-0.350
Leaded red brass, red brass, tin bronze	8.61-8.89	0.311-0.321
Manganese bronze	7.70-8.0	0.278-0.289
Nickel brass, leaded Ni brass	8.75-8.92	0.316-0.322
Yellow brass, leaded yellow brass	8.31-8.56	0.300-0.309
Aluminum bronze	7.31-7.65	0.264-0.276
Silicon bronze	8.23-8.45	0.297-0.305

Melting Points of Various Materials Which Are Used in the Foundry

Material	Melting Point F	Remarks
Alumina	3725	
Aluminum	1218	
Aluminum bronze	1908	
Bauxite	3308	
Brass (67 Cu-33 Zn)	1725	
Bronze (90 Cu-10 Sn)	1850	
Calcium	1490	
Calcium-manganese-silicon	1800-2000	16-20 Ca, 14-18 Mn, 55-60 Si
Calcium-silicon	1850-2100	28-35 Ca, 60-65 Si, 3-6 Fe
Carbon	Infusible	
Cast iron	2065-2400	
Chromite (FeO, Cr_2O_3)	3950	Also chrome brick
Chromium	2930	
Copper	1981	
Copper-aluminum	1070	50 Cu, 50 Al
Dolomite		Dissociates at high temperatures
Ferrochromium	2200-2370	60-72 Cr, 4-8 C, 2-3 Si
Ferrochromium (low C)	2300-2480	69-72 Cr, 0.6-2 C, 2-3 Si
Ferromanganese	2280-2325	78-82 Mn, 6-8 C, 1 Si
Ferromolybdenum	2800-2850	55-65 Mo, 0.5-2 C
Ferrophosphorus	2300	17-25 P
Ferrosilicon (15 Si)	2180 approx.	
Ferrosilicon (50 Si)	2170 approx.	
Ferrosilicon (75 Si)	2150 approx.	
Ferrosilicon (90 Si)	2150 approx.	
Ferrotitanium	2650	17 Ti, 7.5 C, 2.5 Si
Ferrotungsten	3275-3450	78-83 Wo, 1 C
Ferrovanadium	2280-2550	35-40 V, 1.5-8 Si, 0.2-3 C
Firebrick	2800-3100	
Fluorspar		Decomposes at high temperature
Fireclay	2730-3150	
Ganister	2550	98 SiO_2

Material	Melting Point F	Remarks
Iron (pure)	2786	
Iron ore (Fe_2O_3)	2805	
Iron ore (Fe_3O_4)	2800	
Lead	618	
Lime (CaO)		Decomposes at high temperature
Magnesia (periclase)	5070	
Magnesite	3990-5070	Also magnesite brick
Magnesium	1200	
Malleable iron	2375-2575	
Manganese	2246	
Molybdenum	4620	
Nickel	2640	
Nickel, F grade	2275-2350	
Nickel-chromium-copper (pig)	2300	58 Ni, 8 Cr, 24.5 Cu, Rem. Fe
Phosphorus	111	
Pig iron	2066-2300	
Sand	2900-3100	
Silica	3100	Also silica brick
Silicon-manganese	2250	65-70 Mn, 20-25 Si, 1 C
Silicon	2588	
Silicon-aluminum	1920	50 Si, 50 Al
Sillimanite ($Al_2O_3SiO_2$)	3290	
Spiegeleisen	1950-2265	15-30 Mn, 4.5-5 C, Rem. Fe
Steel	2500-2775	
Sulphur	248	
Tin	450	
Titanium	3272	
Tungsten	6152	
Vanadium	3128	
Zinc	787	
Zircon (flour and sand)	3812 approx.	
Zirconium	3090	

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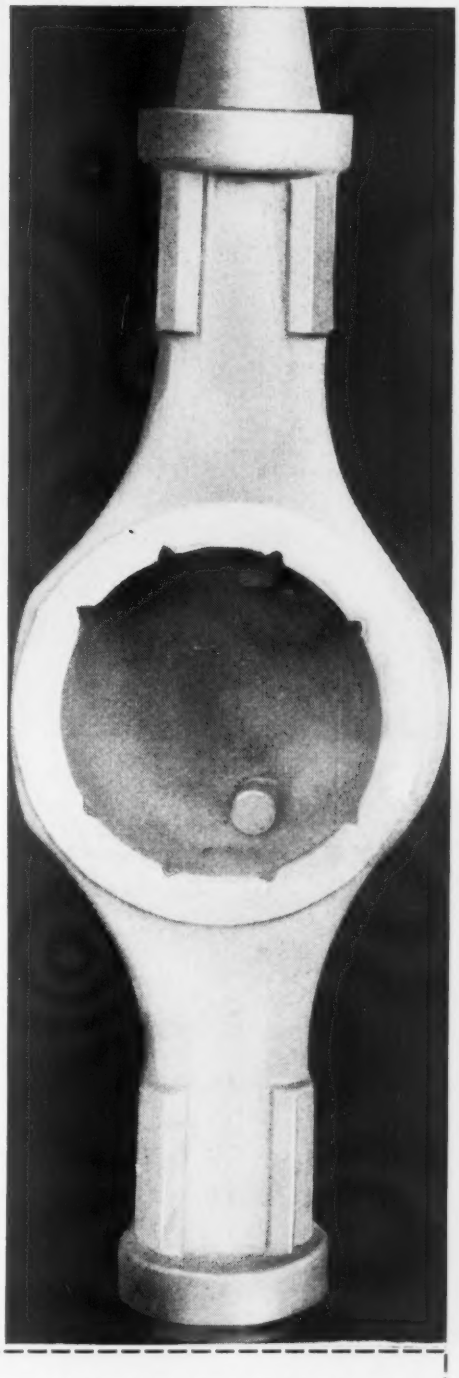

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	TEST BAR	AXLE
Yield Strength	23,500	22,700
Tensile Strength	36,600	35,500
Elongation	7.5	7.5

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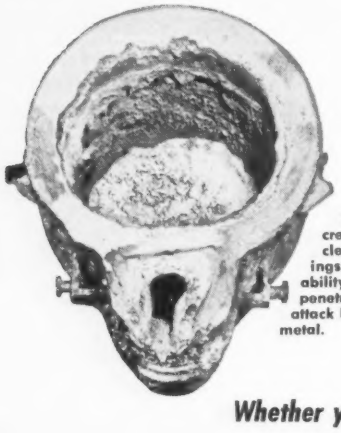

3X Blazecrete means cleaner castings, has great ability to resist penetration and attack by molten metal.

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Industrial Noise Problem Is Becoming More Acute

Health, Production and Safety Are Affected

By Dr. W. Schweisheimer

SINCE the advent of power-driven machinery, the effects of unwanted sound—that is, noise—have never ceased to irritate industry. Today the problem is more acute than ever. Industry is speeding up its machines more than before, using more machines than ever and, consequently, becoming noisier all the time. Noise makes people grumpy. It lowers all faculties, dulls mental processes and makes people irritable and pessimistic. Noise decreases efficiency and production.

How loud a factory din can a worker's eardrums take? That question has become a pressing one for both workers and management. The Workmen's Compensation Board of New York last year adopted a set of standards on the relation between deafness and industrial noise to guide it in settling claims. These standards have not gone unchallenged: The board recently retracted them, currently has them under consideration and will reissue them in either a revised or the original form.

The board came to four main conclusions:

1. The danger limit is 90 decibels. Clatter ranging from 90 to 100 decibels may permanently harm the hearing of a few very susceptible people if they are exposed for many years.

2. An over-all din of 100 to 120 decibels for several hours daily over a long period of time can permanently damage the hearing of a considerable proportion of workers.

3. Most people exposed to noise at levels above 120 decibels for several hours daily will suffer permanent damage to their hearing in a matter of months.

4. The board will not consider permanent impairment cases until the claimant has been away from his work for six months.

A survey of industrial plants showed, according to an extensive study in *Chemical Week*, that 48 per cent of plant managers did nothing about noise; they were unaware of the importance of the problem. Thirty-two per cent of managers were conscious of noise problems and were doing or planned to do something about them. Ten per cent of plant managers were aware of the noise problem, but thought it would cost too much to do anything about it. Finally, 10 per cent of plant managers were unaware of specific problems. They were interested, but un-

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with antiquated hand firing and charging methods can add appreciably to your operating costs.

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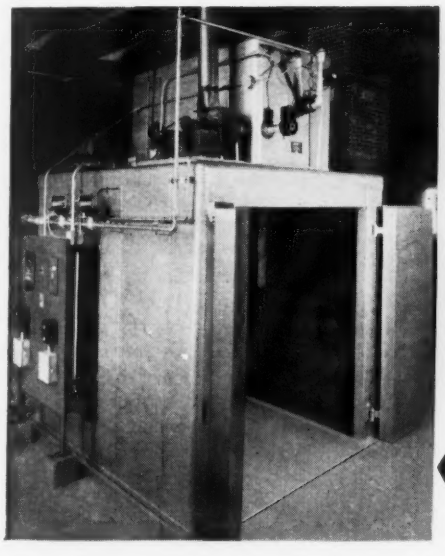

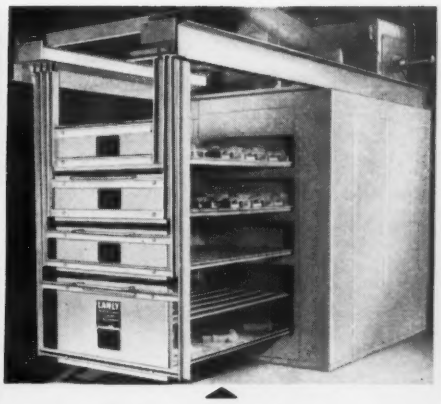

1. Drawer Type Oven
2. Single Compartment Rack Type Oven
3. Car Type Oven

Isn't this an opportune time to examine closely the oven facilities of your foundry for a possible improvement? The average foundry requirements can be met with standard LANLY units. Custom designed units for core baking, pasting and mold drying are part of LANLY'S services, as well as ovens for casting conditioning and heat treating.

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Yes, it's actually refined to 200 mesh. Pioneered by Cedar Heights Clay Co and available everyday in the year to foundry men everywhere. Ask your distributor

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certain as to any future action.

The factors that influence the effects of noise on man include the following, as pointed out in a recent editorial of the *Journal* of the American Medical Association: 1) The fact that noise is sound of an unwanted character; 2) extremes of pitch or frequency; 3) extreme loudness; 4) unexpected sound; 5) uncertainty of the direction from which noise comes; 6) unfamiliarity with sound or inability to identify its cause; and 7) the state of health of the person exposed to the noise.

That the problem of noise soon will have to be faced by all industries is taken for granted by those who have looked into the problem. The effects of industrial and office noise in terms of fatigue and inefficiency long have been underestimated.

More Production through Less Noise—In some plants where machine noises had been quieted, this fact alone increased production capacity approximately 9 per cent. In another plant, it was found that errors were reduced 43 per cent after the noise level in working areas had been lowered 30 per cent.

Howard C. Hardy, a noise expert, quoted experiments which have shown that reduction of the noise level has resulted in efficiency increases up to 9 per cent; reduction of errors by 30 to 50 per cent; and reduction in absenteeism and employee turnover up to 50 per cent. In noisy environments, it is necessary to concentrate harder to accomplish the same amount of work. This strain on nervous tension and attention causes fatigue. Women particularly are affected by such influences. Noise is a major factor in excessive labor turnover in noisy industries.

M. A. Smith, an acoustical engineer, has pointed out that the first principle of noise reduction is, "Don't make it!" Machine designers should consider the noises their creations produce. Machines with rotating parts in which the center of mass does not coincide with the axis of rotation will produce noise at speeds above 1,200 rpm, noise increasing in loudness with the eccentricity.

This Is What To Check

An interesting survey on what can be done about noise abatement recently was compiled by *Chemical Week*. Experts emphasized that although the cost of prevention could come high, the cost of negligence could be staggering. Here are some of the findings:

1. Machines against established noise-rating charts.

2. Machines and equipment that emit steady, frequent, single or repeated impact noises or friction noises like the hiss of steam escap-

Ask Standard how to cut costs with conveyors

Parallel roller conveyor lines facilitate movement of large molds to pouring area. Note simple right angle transfer device.

Job-tailored conveyor systems speed, simplify foundry work

GOOD foundry practice requires smooth handling of molds and cores to reduce losses due to "shifting" or "collapse".

This can be achieved with Standard Gravity Roller and Power Conveyors. Standard's *50 years experience* in engineering and manufacturing *foundry conveyors* can be valuable to you.

Before you embark on any modernization program it will pay you to call STANDARD CONVEYOR COMPANY, General Offices, North St. Paul 9, Minn. Sales and Service in Principal cities.

Steel foundries handle cumbersome molds easily on simple low cost roller conveyors. Special design shielded bearings for rough foundry use give longer life, low maintenance.

Send for Standard's special catalog — a valuable reference book illustrating and describing various conveyor installations in leading foundries. Ask for "Conveyors for Foundries — N2."

Standard 50 years of conveyor experience

GRAVITY & POWER CONVEYORS

Sales and Service in Principal Cities.

ing from boilers; the pounding of pneumatic hammers; or the grate of sandpapering.

3. Areas in which it is impossible to carry on a conversation at arm's length.

4. Areas in which there is a great deal of operating equipment.

5. Areas in which there are large radiating, resonating or reflecting surfaces.

This Is What Can Be Done

1. Insulate walls and ceilings with acoustical panels.

2. Provide workers with ear protectors which actually reduce noise.

3. Properly maintain equipment through lubrication and replacement of worn parts.

4. Enclose or otherwise isolate noisy equipment.

5. Plan layouts of new plants to segregate noisy machines or areas.

6. Buy quieter equipment.

7. Install vibration isolators and mufflers.

8. Build stronger foundations for noisy machines.

9. Select a less noisy alternate process.

10. Use highly absorbent construction materials in building or remodeling plants.

11. Consult sound engineers on specific problems and new developments in the field.

Safety Level—Although no arbitrary safety level can be established for industrial noises, intensities between 70 and 90 decibels for daily exposures of 2 to 8 hours are, for practical purposes, considered harmless for the average person.

In addition to the ears, other organs of the body may be affected by noise, according to a recent study by Charles I. Barron and Fenn E. Poole in *American Journal of Public Health*. The resulting signs are headaches, earache, tremors (trembling), nausea, dizziness, insomnia and vibrations felt in the head and other parts of the body. Such effects usually disappear after some time, particularly upon removal to a quiet area.

Among the most undesirable effects of noise is its interference with speech communication. This condition necessarily results in a decline in the efficiency and morale of workers. Another consequence is an increase in accident rates because of blocked reception of spoken commands and warnings.

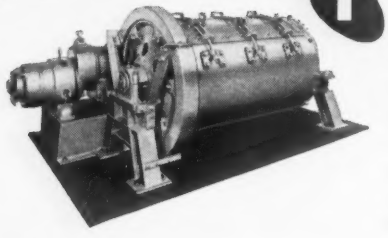
Practical noise control, Barron and Poole point out, can be achieved by the use of absorbing materials in walls and partitions, special isolation of sound-generating tools, use of ear protectors, pre-employment examination and repeated hearing studies of employees and proper placement of personnel.

Good types of ear defenders, properly fitted, may reduce loudness of noises as much as 80 per cent at certain noise levels. Many industrial workers do not like the idea of introducing anything into their ears, but even a 5 or 10-decibel reduction is important when we are just treading on the borderline of discomfort.

Dry-cotton ear plugs are of little value for reducing noise, but wax-impregnated cotton is effective, not uncomfortable to wear and can be replaced daily.

3 steps to more production

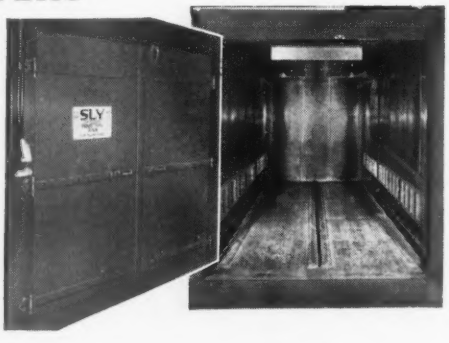
1 SLY CLEANING MILLS

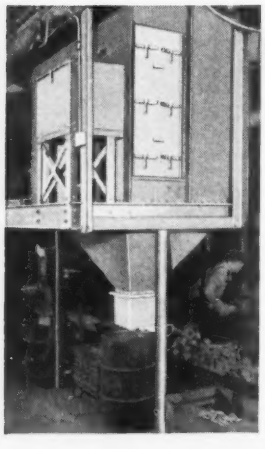


Join the return to less expensive cleaning of castings with these modern, quieter cleaning mills. Clean thoroughly — all castings at once — and save hours and hours of grinding time by eliminating fins as they clean. Your choice of over 120 sizes in batch mills and over 35 sizes in continuous mills, the most complete line of air blast mills, cabinets, blast rooms and other blast equipment in the industry.

2 SLY CORE OVENS

These ovens double production, even triple it in some cases, users say. Cores are better, stronger, less scrap. The efficient handling of heated air in Sly Convectioneered Ovens is the key to their efficiency.





3 SLY DUST FILTERS

These efficient dust filters are also morale-builders, production "pusher-uppers." By eliminating the dust and providing clean air, Sly Dust Filters increase personnel efficiency. A type and size for every need.

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General Electric Co. has produced a sound-slide color film, "Shell Molding and You," for foundrymen, engineers, executives, casting buyers and foundry students. Film is a practical study of the shell molding process, castings and materials. It is available, without charge, by writing to Shell Molding, Room 170, Phenolic Products, General Electric Co., 1 Plastics Ave., Pittsfield, Mass.

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Woman

Above, Mrs. Irene Lewis and Bob Harpur, her able right-hand man, work out some of the details of a new engine

Visiting freeloaders delight in riding the high iron when the Southern California Live Steamers Club holds its meetings on the company grounds

Most of the metal poured in the Little Engines foundry is one of several bronze alloys, but some aluminum also is poured, as in aluminum frames for matchplate-mounted patterns

in a Man's World

By LEWIS B. REED

Chris Overstreet works on a mold as Mrs. Lewis and Bob Harpur watch. The dog is one of five pets in the plant

View shows furnace and core oven of the Little Engines foundry, which contains only 240 sq ft of floor space

A FOUNDRY is hardly the place for a woman—even a backyard foundry—but sometimes circumstances play funny tricks. Some 23 years ago, the husband of Irene Lewis, Lomita, Calif., had a hobby—an exacting hobby. Steam locomotives were in his blood, and he spent his spare hours building scale-model live steamers from scratch. Starting with a few pieces of rod, bar and scrap metal, he built patterns, made castings, machined parts and assembled operating steam locomotives and tenders complete to the last detail.

A locomotive requires many castings, and before long he had a large accumulation of patterns. These gathered dust in his workshop until Irene smelled a chance to make a little extra money. Other scale-model live steamer enthusiasts did not mind eliminating a few of their headaches, and she could supply them with rough castings made from the patterns.

Casting sales were only so-so for a good many years, and when her husband died seven years ago she did not know whether to continue the sideline or starve some other way. Fortunately she decided to stick with the live steamers and today is making a nice living out of her backyard manufacturing plant. Her industrial empire now consists of a manufacturing plant housed in five buildings; of miles of railroad track (scale, of course); of a turntable which can accommodate 14 coal-fired, steam-spouting locomotives; and her own stable of locomotives, which would turn any railroading hobbyist green with envy. And the whole empire is in her backyard!

Business is booming, and Mrs. Lewis, through necessity, has learned a lot about the foundry business. Most of her transactions are via mail order, and she has found that jobbing foundries are too busy to get an order out in two or three days. As a result, her foundry work is done in the backyard in a building containing all of 240 sq ft of floor space. It is complete in all respects, although hardly in a mechanized form or with all the doo-dads found in Ralph Lee's hobby palace.

Castings are mostly bronze: 85-5-5-5, M-metal, and G-metal, for example. Nothing but ingot is used. A cast pressure vessel has eliminated one of the biggest headaches with live steamers. If not cast, the vessels have to be welded together and the various sheets hammered out on wooden forms. Her pressure vessel contains wrapper sheet, crown sheet, crown stays, stay bolts, throat sheet and even the mud-ring in one casting. This single casting eliminates several weeks of work otherwise necessary. To meet approval, it passes a hydrostatic test of 325 psi.

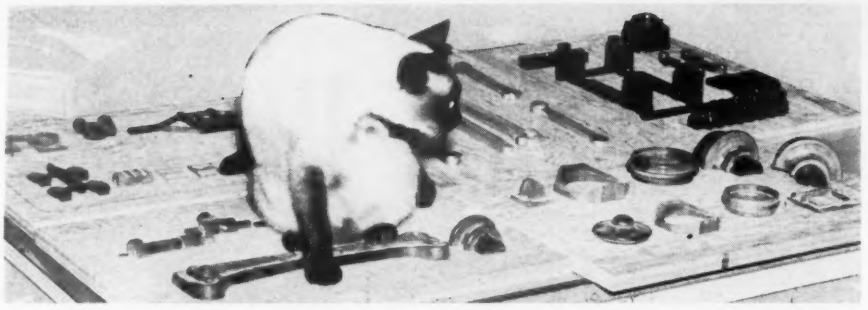
Most of the loose work is small and is attached to matchplates. This arrangement will speed up production as soon as a jolt machine on order has been installed. Parts for 20 locomotives and tenders are carried in her catalog, and it takes over 4000 patterns to supply the parts. Inventory time is a nightmare!

Although Mrs. Lewis employs a patternmaker and a foundryman, she finds it necessary to assist in the foundry when a helping hand is needed to skim the metal or make a few cores. In this age of specialization,

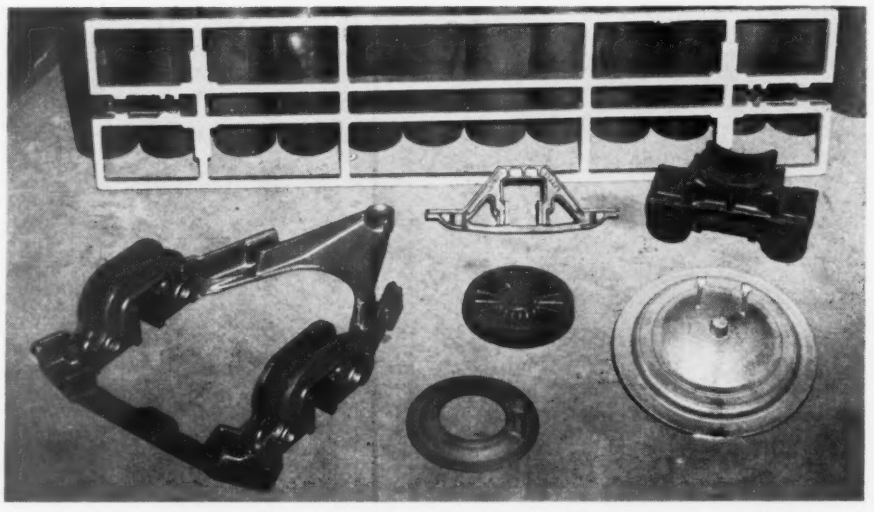
it is hard to find all-around foundrymen who can do all the required tasks and will work for a woman in a backyard shop. She has learned foundry techniques the hard way, yet is very reluctant to let anyone discover it because she believes other people think a woman does not belong in a foundry.

Besides having been forced to learn foundry procedure, she found that locomotives scaled down from original drawings did not always function properly. It took engineering knowledge to find the proper firebox area, smokestack diameter, piston pressure, etc., for each new model. This need forced her to take a course for locomotive engineers and firemen which gave her the needed engineering information and helped her to design products which would work at the highest efficiency possible. This course was in addition to others in mechanical engineering. It has been hard work for her, but it is paying off. The Iron Horse is on its way out, and it will not be long before examples are found only in collections. This situation will only add to the eagerness of hobbyists.

Parts are available for 20 different locomotives and tenders, in either the rough-cast or machined state. The simplest locomotive, an 0-4-0, comes completely machined, ready to bolt together. It will not be long before



Banned from the foundry, Mrs. Lewis' Siamese cat examines some patterns



Some castings representative of those made in the Little Engines foundry

Mrs. Lewis holds a cast pressure vessel, one of the more complicated parts cast in her foundry. The locomotives in the picture are part of her own collection

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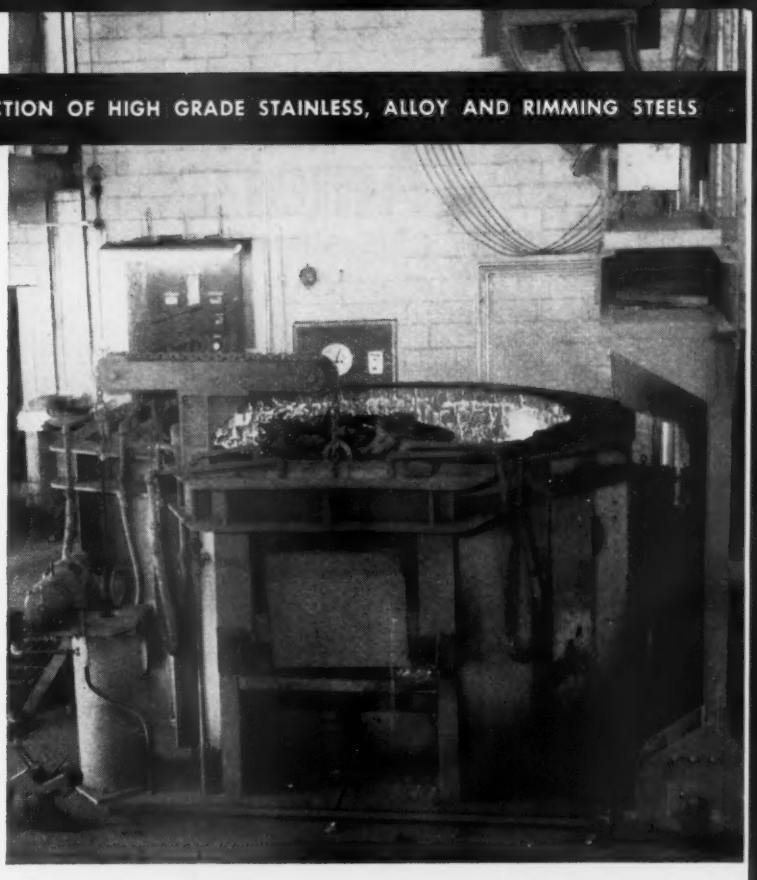

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Every day more people who work with their brains all day are finding an outlet for their creative urge in building models. Many are in love with steam locomotives, and among these are craftsmen who derive satisfaction in exacting work which requires high skill. These are the men who will not be satisfied with a scaled exterior driven by an electric motor, but want to hear the hissing of steam and feel the brute strength of a scaled-down, panting monster. They are going to find a true friend in Irene Lewis, who knows live steaming as well as anyone in the hobby. She is a woman in a foundry, and a woman in a man's hobby. And she is a woman respected for her craftsmanship and knowledge of locomotives.

Publishes Air Pollution Data

Summaries of current literature pertaining to air pollution now are available in *APCA Abstracts*, a new publication of the Air Pollution Control Association. Purpose of the abstracts is to bring together a complete listing of all such material for easy reference. For the time being, the listing is sent only to members of the association, which is located at 4400 Fifth Ave., Pittsburgh 13.

Book Review

Engineering Metallurgy, by L. F. Mondolfo and Otto Zmeskal, cloth, 6 x 9 in., 397 pages, published by McGraw-Hill Book Co., 330 West 42nd St., New York 36. Price $7.50.

Book is written as a college text for teaching of metallurgy to engineers whose primary interests do not reside in metallurgy. Detailed descriptions of methods and operations are given, but emphasis is on the theoretical reasons behind the operations. Several chapters are devoted to basic theory of metallurgy as an introduction to those chapters which deal with practical applications.

Extraction of metals, atoms and crystals, casting principles and casting practice, plastic deformation and annealing, annealing and heat treatment practice, joining, powder metallurgy, corrosion and protection are some of the material covered by chapter headings. Two chapters are devoted to commercial metals and alloys. For each metal is given a brief description of its extraction, effect of alloying elements on its properties, and tables of alloy compositions, properties and uses.

ACTIVITIES
of Foundry Groups

Twin City: Annual joint meeting of the AFS chapter and the ASM chapter was held Nov. 1 at the Calhoun Beach Club with 145 attending. ASM chapter, as hosts, arranged a presentation of the Wilkie Foundation exhibit, "Civilization Through Tools." C. G. Schelly, managing director, Wilkie Foundation, explained that over one-million years of man's evolution was presented in the exhibit. Mr. Schelly's commentary pointed out the relationship between man's industrial growth and the tools he developed to match his increasing skill.

Regular chapter meeting was held Nov. 29 at the Covered Wagon Restaurant, Minneapolis, with H. H. Blosjo, Minneapolis Electric Steel Castings Co., presiding. J. Roth, Progress Pattern & Foundry Co., served as technical chairman. M. J. Kelly, personnel and public relations director, American Steel Castings Inc., spoke on "The Foundry and the Community" to the 70 members and guests present.

Mr. Kelly presented statistics illustrating the importance of the foundry to the national economy and the American public. Speaker concluded with suggestions for improving public relations for any shop, regardless of size. Support and promotion of community functions and charities were emphasized.

Eugene Eggenhausse, apprentice patternmaker, American Hoist & Derrick Co., was awarded a student membership in the chapter and given a check in recognition of placing highest among entrants from the Twin City area in the 1955 national apprentice contest.

Annual Christmas party was held at Hotel Nicollet, Minneapolis, on Dec. 10. Over 250 foundrymen and guests attended and enjoyed dinner, entertainment and dancing.—*R. J. Mulligan, Archer-Daniels-Midland Co.*

Western Michigan: Roy J. Carver, Carver Foundry Products Co., Muscatine, Iowa, enlightened AFS chapter members on the CO_2 process at the Nov. 7 meeting held at The Fingers, Grand Rapids, Mich., with 125 members present. George W. Bartlett, Neway Equipment Co., chapter chairman, presided. Mr. Carver said that a washed, clay-free sand is necessary to make good, clean, hard cores with the process. He also made it clear that the process can be used in high-production foundries as well as in the job shop. A film accompanied the discussion.—*Joe Cannon, Muskegon Aluminum Foundry Co.*

Ontario: "Pressure Molding" was the subject of G. W. Merrefield, Giffels & Vallet Inc., at the Dec. 9 Past Chairmen's Night meeting of the AFS chapter at the Royal Con-

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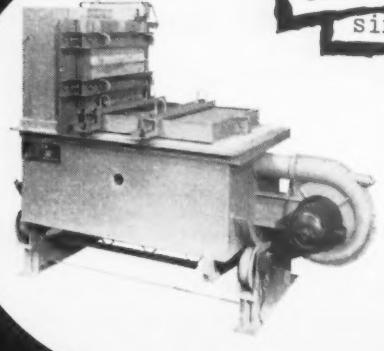

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REDA FURNACE

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naught Hotel, Toronto. A. Rayburn, Cockshutt Farm Implement Ltd., served as technical chairman. Thirteen past chapter chairmen attended.

Mr. Merrefield described, with the aid of slides, some significant considerations of pressure molding and stated that the diaphragm machine is being improved so that increasing speed is possible. Sand control for utmost flowability is important. Flasks must be rigid to avoid springing under pressure.—*Dave Magder, United Smelting & Refining Co.*

Chicago: For its Management and Past Presidents' night program, 325 members and guests of the AFS chapter heard James H. Smith, general manager, Central Foundry Division, General Motors Corp., Saginaw, Mich., discuss the modern foundry and stress ways of improving methods and processes. His presentation included showing a color-sound movie "To Meet the Challenge," shown publicly for the first time.

Seventeen of the chapter's 22 past presidents attended the meeting and were honored. AFS National President Bruce L. Simpson, president, National Engineering Co., paid tribute to the past presidents. Regional Vice President C. V. Nass, vice president, Beardsley & Piper Division, Pettibone Mulliken Corp., also was present.

In his talk, Mr. Smith presented a long list of subjects falling into the categories of metallurgy, manufacturing and personnel that foundrymen should study and explore. Progress, he said, will stem from discoveries growing out of research in these fields.

Next chapter meeting will be held Feb. 6 at the Chicago Bar Association and the program will feature four roundtables. Malleable and Nonferrous divisions will see the AFS sound movie "Study of Fluid Flow Through Vertical Gating." Pattern division will consider "Research in Pattern Coatings"; Gray Iron and Maintenance division, "Progressive Mechanization on a Small Budget"; and Steel division, "Welding Rods and Machines."

The Annual Ladies Night is scheduled for Feb. 11 at the Knickerbocker Hotel.—*Erle F. Ross.*

Canton: Eighty-six members and guests attended the AFS chapter meeting at American Legion Hall, Massillon, O., on Dec. 1. C. A. Sanders, vice president, American Colloid Co., Chicago, spoke on "Synthetic vs. Natural Bonded Sand." H. A. Biddinger, F. E. Myers & Bros. Co., Ashland, O., presided and W. W. Snodgrass, Massillon Steel Castings Co., Massillon, O., introduced the

speaker and also served as host.

Mr. Sanders stressed that good castings can be made by using conventional foundry methods, if properly supervised and controlled. He stated it is important to double check conventional methods before plunging into one of the new "processes." —*R. R. Kozinski, Canton Malleable Iron Co.*

Metropolitan Brass: About 170 members and guests of the Metropolitan Brass Founders Association braved snow and inclement weather on Nov. 19 to attend the organization's 45th anniversary celebration at the New Brass Rail, New York. Dinner, dancing and entertainment highlighted the program.—*George Staub.*

Reading: Reading Foundrymen's Association met Nov. 15 at the Berkshire Hotel, Reading, Pa., and heard William J. White, general manager, Shallway Corp., Connellsville, Pa., discuss "Shell Molding and Shell Cores." William Ruten, Brooklyn Polytechnic Institute, addressed the group at its Jan. 17 meeting.—*W. I. Cassidy.*

Wisconsin: Some 600 members of the AFS chapter turned out Dec. 9 at the Crystal Ballroom, Hotel Schroeder, Milwaukee, to enjoy the annual Christmas Party. The usual dinner and floor show, with foundrymen participating as stooges in the latter, were well received.—*John E. Hubel.*

Central Ohio: One hundred members and guests of the AFS chapter attended the annual Christmas Party at the Seneca Hotel, Columbus, O., on Dec. 11. Dinner and dancing highlighted the program.—*Jose Acebo, Ohio Malleable Iron Division, Dayton Malleable Iron Co.*

Philadelphia: Annual William B. Coleman dinner meeting of the AFS chapter was held Oct. 7 at the Engineers Club, Philadelphia, with 125 attending. A scholarship was presented in Mr. Coleman's name to a student of Penn State University. The speaker for the evening was Harry W. Dietert, Harry W. Dietert Co., Detroit, who talked on "Load Carrying Power of Sand and its Effect on Shrinks and Yield."

About 100 persons attended the November meeting to hear a talk by C. A. Thomas, manager, engineering sales, National Engineering Co., Chicago, on the subject "Progress in Foundry Automation."

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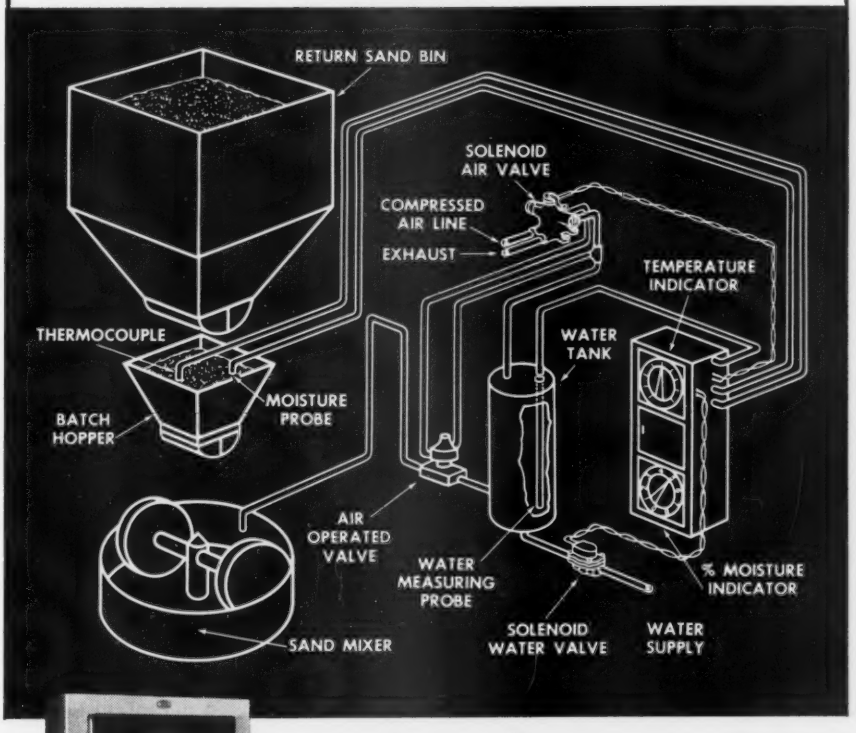

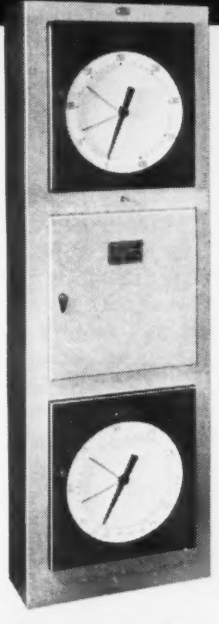

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attended the annual Christmas Party held in December. The usual turkey dinner and floor show highlighted the entertainment.

W. G. Gude, managing editor, FOUNDRY, will be the featured speaker at the Feb. 10 meeting at the Engineers Club. He will discuss the "Castings Market." — *Charles R. Sweeny, Atlantic Steel Castings Co.*

Birmingham Meeting Scheduled By Southeastern Foundrymen

A diversified program of ten technical papers has been arranged for the 24th Southeastern Regional Conference. The meeting will be held Thursday and Friday, Feb. 16-17 at the Tutwiler Hotel, Birmingham. As in recent years, it will be sponsored jointly by the Birmingham District Chapter, Tennessee Chapter and the University of Alabama Student Chapter of the American Foundrymen's Society.

Albert J. Fruchtl, W. Thomas Barr Associates, Birmingham, is Birmingham District Chapter chairman, and William B. Greiser, Ross-Meehan Foundries, Chattanooga, heads the Tennessee Chapter.

Program details follow:

Thursday, Feb. 16

9 a.m.—**Registration**

10 a.m.—**Shell Cores,** Ray Olson, Shell Process Inc., Chicopee, Mass. Chairman, W. Thomas Barr, W. Thomas Barr Associates, Birmingham.

11 a.m.—**Job Evaluation,** Milton E. Annich, American Brake Shoe Co., Mahwah, N. J. Chairman, C. J. Pruet, McWane Cast Iron Pipe Co., Birmingham.

12:30 p.m.—**Luncheon:** John F. Drenning, vice chairman, Birmingham Chapter, Kerchner, Marshall & Co., Birmingham, presiding. Speakers: Bruce L. Simpson, national president, AFS, National Engineering Co., Chicago; William W. Maloney, general manager, AFS, Des Plaines, Ill.

2 p.m.—**Selection and Preparation of Sands for Foundry Use,** Earl E. Woodliff, Foundry Sand Service Engineering Co., Detroit. Chairman, Charles S. Chisolm, Wheland Co., Chattanooga, Tenn.

3 p.m.—**High-Pressure Molding,** Tom E. Barlow, Eastern Clay Products Dept., Chicago. Chairman, Morris Hawkins, Stockham Valves & Fittings Inc., Birmingham.

4 p.m.—**CO_2 Process,** Hans J. Heine, National Office, AFS, Des Plaines, Ill. Chairman, Warren C. Jeffery, University of Alabama.

Friday, Feb. 17

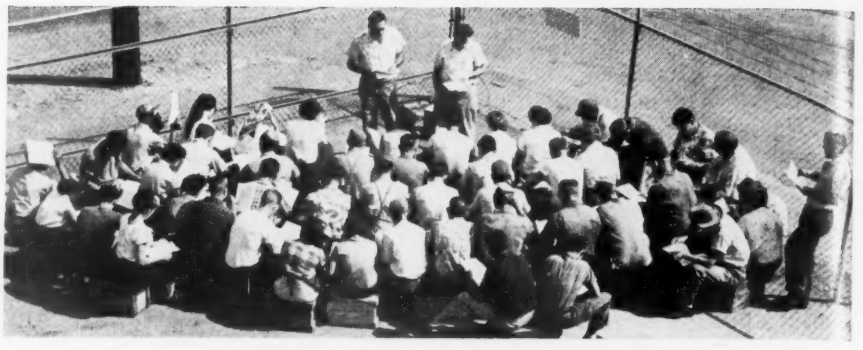
9 a.m.—**Plant Visitation.** Chairman, W. Harry Bailey, Alabama By-Products Co., Birmingham.

1 p.m.—**Foundry Refractories,** L. L. Gill, Harbison-Walker Refractories Co., Pittsburgh. Chairman, Sam F. Carter Jr., American Cast Iron Pipe Co., Birmingham. **How the Melting of Brasses and Bronzes Affects the Quality of Castings,** William Ball Jr., R. Lavin & Son, Cincinnati. Chairman, J. B. Lankford, East Birmingham Bronze Foundry Co., Birmingham.

2 p.m.—**Cleaning Castings,** A. Lesley Gardner, Pangborn Corp., Hagerstown, Md. Chairman, Raymond F. Frings, Raymond F. Frings Co., Birmingham.

3 p.m.—**Upgrading of Iron,** G. P. Dahm, Linde Air Products Co., New York. Chairman, M. D. Neptune, National Cast Iron Pipe Div., Birmingham. **Nonferrous Foundry Practice,** D. L. LaVelle, Federated Metals Division, Perth Amboy, N. J. Chairman, Arthur Orazine Jr., Anderson Brass Works Inc., Birmingham.

7 p.m.—**Annual Banquet:** Albert J. Fruchtl, chairman, Birmingham District Chapter, W. Thomas Barr Associates, Birmingham.



Employee-Supervisor Meetings Boost Production and Morale

By WALTER E. MILLER JR.
Director of Industrial Relations
Kwikset Locks Inc.
Anaheim, Calif.

EMPLOYEE-supervisor meetings aid greatly in improving communications from management to employees and from employees to management. And because of the improved communications, morale and productivity are increased. That is the opinion of Kwikset Locks Inc., Anaheim, Calif. Although no statistics are available to indicate increased productivity, it is felt that the improved morale of workers definitely has had a beneficial effect on over-all production.

Kwikset started its communications program in September, 1954, after considerable study. The company feels that the employee-supervisor meetings, with due consideration for the expense involved, have been of real value in establishing two-way communications.

The program was started by first giving all office and factory supervisors a twelve-session training course in effective communications. Each of the sessions was approximately 2 hr long and comprised, basically, a public speaking course. Following the communications training, supervisors were given conference leadership instruction to prepare them for leading group discussions.

Each month a detailed outline is prepared by the industrial relations department to be used as a guide by each supervisor in conducting his employee-supervisor meeting. The day before that meeting, supervisors and representatives of management hold a briefing session for a trial run of the meeting and to allow time for questions and answers with the supervisors.

The supervisor conducts the meetings with employees in his department, covering content of the outline prepared by the industrial relations department. Subject matter includes business conditions, wages, projects, competition, new products, personnel policies, cost reduction, seniority, personnel moves, and other subjects related to running the business.

Following the supervisor's presentation of information, the meeting is opened for discussion. Employees are urged to present comments, criticisms, suggestions and in other ways to indicate their thinking on

the subject matter presented or on other topics they choose to discuss.

Immediately after the meeting supervisors are required to prepare a memorandum to the industrial relations director, outlining comments and questions made by his employees. The director discusses each question with the supervisor so that he may present the factual picture to his employees. Every question, even though some may be pointed, is answered so that the employee knows the situation exactly.

Through these meetings, the supervisor gains a better understanding of company policy and problems. His sense of responsibility and morale are improved because he is accepted as part of the management team and is not being circumvented in the line of communications. He also gains prestige in the eyes of his employees.

Employees are well-informed and have high morale because of the openness and frankness with which all their questions are answered. They gain additionally because their supervisor is becoming increasingly better informed.

The idea presented in this article earned the Research Institute of America's Award for Merit. Such awards are given "for effective contribution to the development of executive skills in human relations."

Book Review

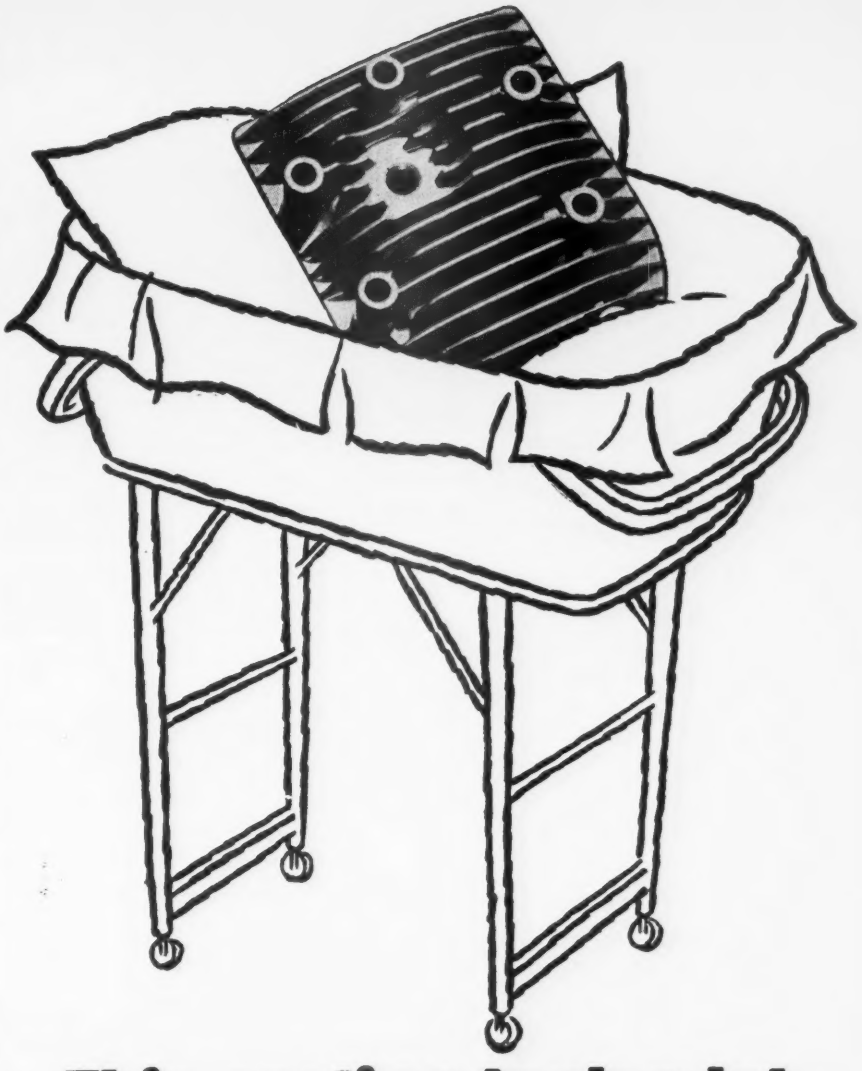
Aluminum in Iron and Steel by Samuel L. Case and Kent R. Van Horn, cloth, 6 x 9 in., 478 pages, published by John Wiley & Sons Inc., 440 Fourth Ave., New York 16. Price $8.50.

This book is one in a series planned to provide metallurgists, engineers and foundrymen with essential information from the technical literature of the world on the effect of selected metals on carbon steel and on simple and complex alloy steels and cast irons.

First part of the book contains a summary of data showing the favorable effect of small amounts of aluminum when added to molten steel as a deoxidizer. Second part offers a correlation of data on the effect of aluminum as an alloying element in steel. The phenomena of inclusion formation, grain size, notch sensitivity and aging are also treated.

Foundry Has Anniversary Party

Atlantic Steel Castings Co., Chester, Pa., celebrated its 40th anniversary on Nov. 12 with an open house, plant visitation, party and luncheon attended by some 646 persons, including officers, guests, employees and their families. Five of the original employees, who are still with the company, attended.



This casting took a lot of pre-natal care

The success of a casting is often determined long before the metal is melted and the casting poured, because no matter how carefully casting is done nor how excellent the mold, a quality part cannot result unless quality metal is used.

Foundries and die-casters need ingots that will be alike in quality and characteristics from lot to lot, especially when castings of intricate character must be precisely cast in quantities. To assure such results, the Federated Metals Division of American Smelting and Refining Company employs the most modern quality control methods. Electronic testing devices and expert metallurgists check each heat poured from Federated's furnaces.

Both supporting and preceding quality control is Federated's modern Central Research Laboratory, which has developed alloys such as Castomatic® type metals and solders and Tenzaloy, the high strength aluminum alloy that ages without heat treatment.

Whatever you need in non-ferrous ingot metal, or in technical service to assure good non-ferrous castings, think of Federated first as your source of supply and technical information. Our broad experience with all kinds of non-ferrous metals has earned us our reputation as Headquarters for Non-Ferrous Metals.

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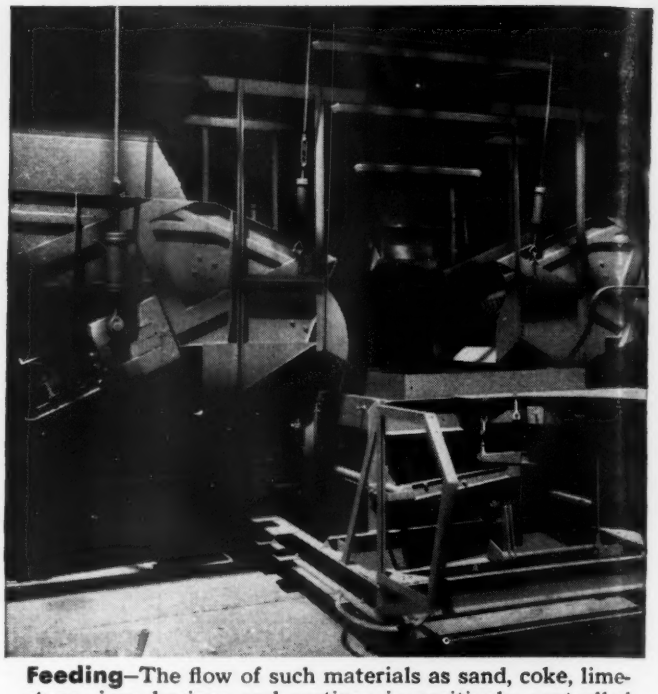
JEFFREY puts VIBRATION to work in the foundry



Feeding—The flow of such materials as sand, coke, limestone, iron borings and castings is positively controlled by JEFFREY vibrating feeders. Rate of feed can be changed while a unit is running, and the response is instantaneous. No mechanical adjustments are required and power consumption is low. Units shown are vibrating feeders with grizzly sections, delivering coke and limestone from bin storage to a weigh car.

Conveying—JEFFREY mechanical vibrating conveyors are widely used for handling foundry sand and castings. Their gentle, but positive, conveying action does not tumble or degrade even fragile castings. Units are compact, sturdy and dustproof, with no wearing parts in contact with conveyed materials.

Cooling—Castings move slowly along this JEFFREY mechanical vibrating conveyor, which serves as a cooling means. Similar conveyors within the foundry carry small poured molds to the shakeout.

For a free copy of Catalog 845 describing foundry equipment, write to The Jeffrey Manufacturing Company, Columbus 16, Ohio.

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Trucks

Provide Flexibility in

Material Handling

Ingots in storage yard are now stacked 18-20 ft high by lift truck, providing a 300-percent increase in the capacity of the yard

FROM a meager beginning in a home basement 13 years ago, Arrow Aluminum Casting Co., Cleveland, has risen to a level of prominence in sand, permanent mold and die casting of aluminum components in varied shapes and in sizes from ½ oz up to 1100 lb.

Today 180 employees produce aluminum-alloy castings for the automobile, bus, truck, aircraft and appliance industries. Applications are diversified so that no more than 20 per cent of the total volume is devoted to any one part.

Paralleling the varied and diversified size, shape and weight of the castings are many demanding materials handling problems — moving sand, loading and unloading cores, transporting refuse, moving machinery and unloading ingots. Use of two Towmotor Co. lift trucks with attachments has mechanized these operations and effected major savings in time and cost compared with other methods.

Utility and flexibility have resulted from use of the trucks and their various attachments. One unit normally is fitted with a scoop for loading cores and rubbish into dump trucks; on occasion the scoop is interchanged with standard or extended forks for inplant use and on the loading dock.

Raw material in the form of 30-lb aluminum ingots is received in 50,000 and 100,000-lb carload lots at a railroad siding, across a main traffic artery and about ¼ mile from the plant. Ingots are loaded to a truck, transported to the plant, stacked in an outside storage yard and taken inside as needed.

At one time this operation required six men unloading by hand and another two men to restack ingots in the yard. Two men now unload the freight car in an average of four hours. Ingots now are purchased in palletized form, and the average load handled is 3000 lb, with the ingots remaining stacked until needed for production.

Since primary raw material consists only of ingots stored in the yard and all finished castings are made for immediate shipment, there

Trucks with various attachments are called upon to perform many different material handling functions

Movement of cores in and out of ovens is performed by truck with fork attachment replacing the scoop

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- **GREATER EFFICIENCY**
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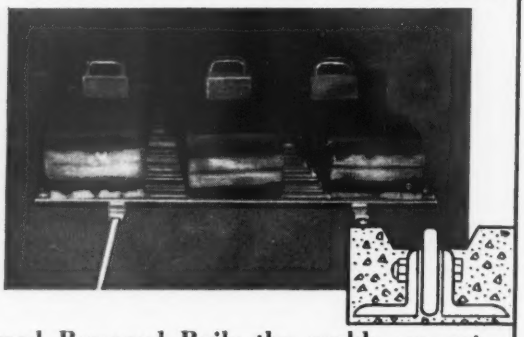

When you use Nomad Recessed Rails the molds are set on a pallet, sent down the conveyor line and poured. This modern procedure marks the tremendous improvement between the old "running out" and the new "rolling away" of molds. The work area is kept clear. There is added time for increased production. And, shake-out and sand preparation can be handled with existing equipment. The whole Nomad process is *easier*. That's all there is to it!

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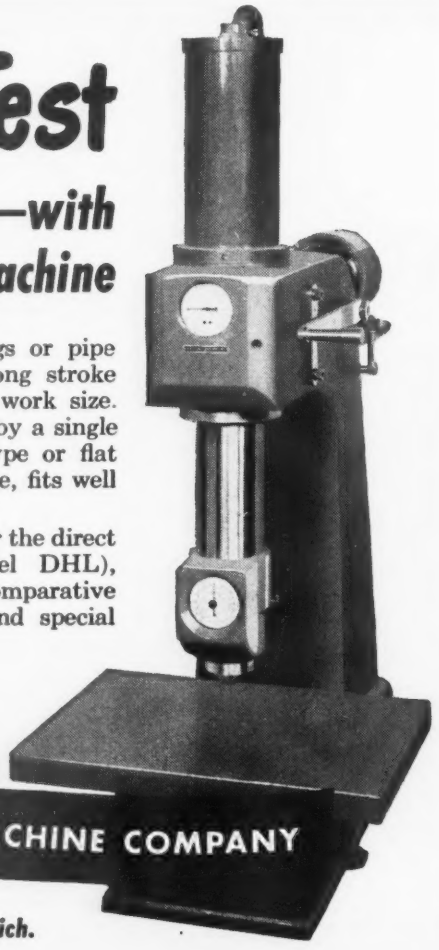
Choice of plain Brinell machine or the direct reading machine (shown, model DHL), where dial at end of ram gives comparative hardness immediately. Larger and special machines may also be had.



Write for more information on all our Brinell testing machines.

DETROIT TESTING MACHINE COMPANY

9382 Grinnell Ave., Detroit 13, Mich.

is no warehousing or storage problems of finished products awaiting shipment.

Storage capacity of the yard is about 500,000 lb. By former methods, ingots could be stacked as high as a man could reach—about 7 ft—but with the lift truck they are stacked 18-20 ft, providing a 300-per-cent increase in storage capacity. This change increases the amount of aluminum that can be inventoried, cuts frequency of purchase and permits large volume orders.

Cites Three Foundry Operators For Excellent Management

Three firms in the foundry industry are among 408 American and Canadian companies cited for excellent management by the American Institute of Management during 1955. They are American Brake Shoe Co., New York; Lynchburg Foundry Co., Lynchburg, Va.; and United Engineering & Foundry Co., Pittsburgh. American Brake Shoe and United are receiving the award for the sixth consecutive year and Lynchburg for the third.

Purpose of the award, according to the institute, is to "bring deserved recognition to those companies whose managements are doing most to increase productivity, with accompanying benefits to employees, shareholders, their community neighbors, and to the economy as a whole." The American Institute of Management, a nonprofit foundation devoted to the study and improvement of corporate organization and management, is located at 125 East 38th St., New York 16.

Book Review

Principles of Physical Metallurgy and *Alloy Series in Physical Metallurgy* by Morton C. Smith, 6 x 9 in., cloth, 417 and 338 pages, respectively, published by Harper & Bros., 49 East 33rd St., New York 16, N. Y. Price $6 each.

These two companion volumes provide an up-to-date presentation of the fundamentals of metal behavior and the effects of composition and heat treatment upon the structures and properties of metals and their alloys. The former develops the science of metal behavior as an integrated, consistent and satisfying chain of reasoning. The latter, beginning where the first volume ends, presents a systematic discussion of the effects of composition, heat treatment and forming procedures upon the microstructures and properties of metals and alloys.

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Moreover, this stable resin speeds baking, a feature on which you can capitalize either to secure faster production or to effect fuel savings.

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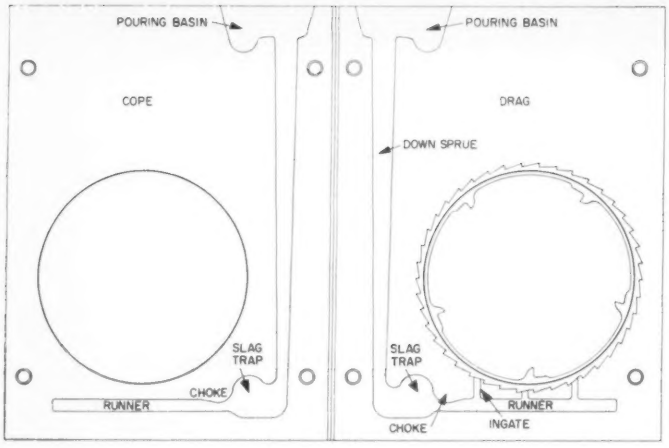


Fig. 1—Diagrams show how the gating for shell molding may be arranged. Down sprue has a 3 to 1 ratio

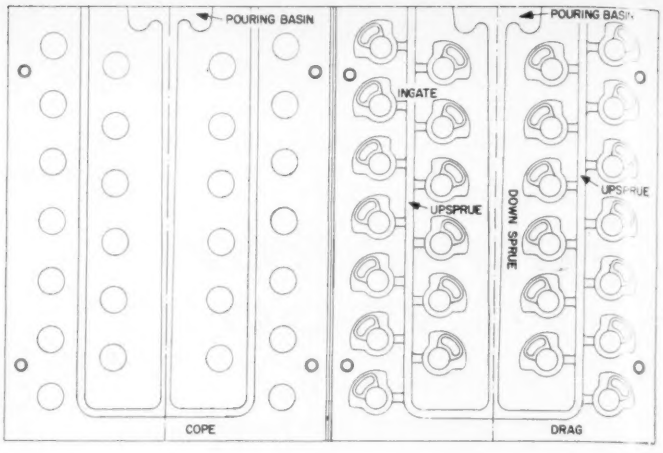


Fig. 2—Castings fed from up sprue are consistently cleaner than castings gated from a down sprue

Factors in the Gating of SHELL MOLD CASTINGS

TO PRODUCE shell mold castings successfully requires special effort, particularly in their gating. Precautionary measures are necessary if castings are to be gated to radiographic soundness. Conventional concepts of foundry practice have been modified in the shell molding process, but unfortunately all foundrymen do not agree on what is the proper application of gates.

Wherever possible, a patternmaker and a foundryman—both highly skilled and experienced — should study and devise the most suitable method of gating each casting. Necessary corrections can be made after each experimental casting is poured. When the desired molding method has been developed, the job can be put into production. Trial and error is still largely the procedure in making a serviceable pattern for shell molding.

Shell casting defects may be occasioned by the extremely smooth surface of the gating system. The metal enters the mold with little or no resistance since the highly glazed sand-resin surface allows the metal to flow freely. A good gating system requires that pouring turbulence and splashing in the mold cavity be kept at a minimum and that the metal enter the mold at relatively moderate speed. These specifications may be realized by proper design of the gating system, e. g., use of a tapered sprue accompanied by slag trap or well, and runners with cross-sectional area greater than that of the lower portion of the sprue. Bot-

Editor's Note: This material represents a portion of a booklet, "Shell Molding with Plaskon Resins," and is reprinted by permission of the publishers—the Barrett Division, Allied Chemical & Dye Corp., New York.

Fig. 3—Use of a slag trap at bottom of down sprue prevents entrained dirt from reaching mold cavity

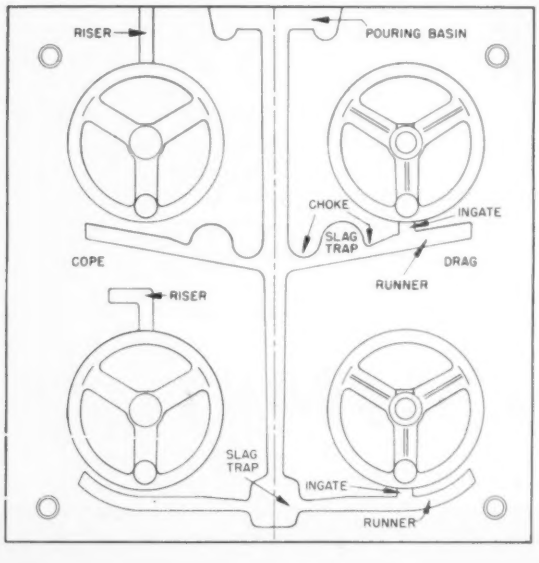
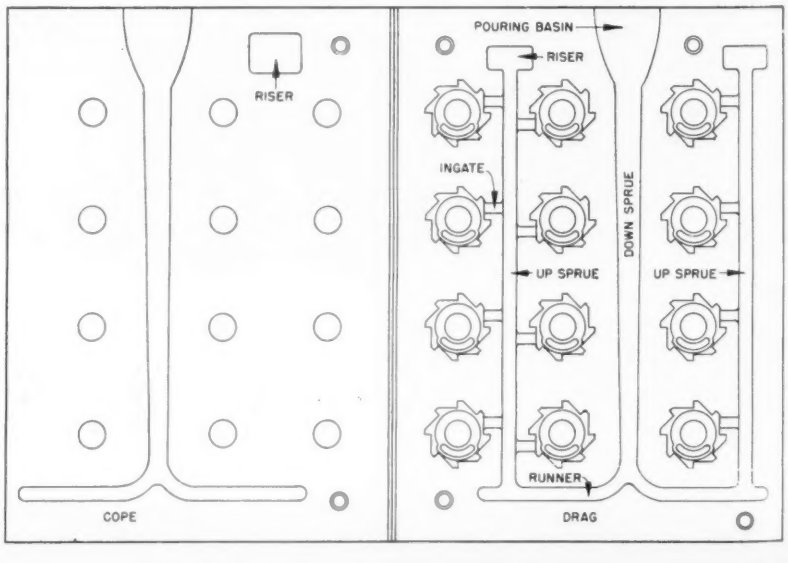


Fig. 4—The pattern illustrated in this diagram is used for shell molding of brass or bronze castings



tom gating in conjunction with a tapered sprue also aids in reducing metal turbulence. These steps allow the metal to be brought to the lowest part of the casting cavity with as little disturbance as possible.

How a mold is filled with molten metal determines to a large extent the quality of a shell mold casting. Dirty castings and random shrinkage defects are minimized by proper mold filling procedure. The ideal gate is one that will admit metal in sufficient volume to fill the mold in a period of time that will prevent cold shuts and at the same time will not subject the face of the shell mold to undue pressure or erosion. Naturally, at times these conditions vary widely and a nice sense of judgment, based on practical experience, is required to design gates that will function satisfactorily.

Gating Must Be Suited to Metal

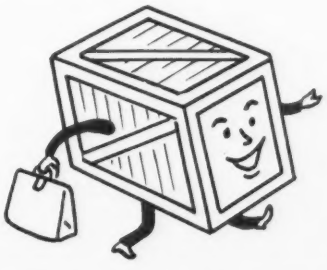
Gating technique must be suited to the characteristics of the metal; physical and chemical properties of the metal often dictate the procedure to follow. For example, certain precautions are necessary with malleable iron in shell molding—similar care being necessary in conventional malleable iron casting practice. Since malleable iron has a lower carbon content and a higher specific gravity, it has more pronounced shrinkage tendencies than gray iron. A more elaborate system of gating and risering therefore is necessary to prevent shrink cavities and porosity from occurring while the metal changes from the liquid to the solid state.

The amount of malleable iron required to fill the gates and risers equals, and in some cases exceeds, that used in the casting itself. Experience has shown that this is necessary for the production of sound shell castings. Moreover, the speed at which the metal is introduced into the mold is also important. If poured too fast, the shell mold walls will yield to pressure. If the metal is poured too slowly, it will freeze before the mold cavities are filled. The man pouring malleable iron into a shell mold must acquire a knack and an instinctive "feel" to insure the production of sound castings.

Most shell mold gray iron castings do not involve appreciably large cross sections and, therefore, risering is not a problem. Experience will dictate the need for risers; for small castings they may not be required at all. Shrinks frequently are eliminated by a change in gating. With steel, magnesium, malleable iron, nodular iron, Meehanite and other metals subject to porosity, every foundryman has his own rules for the adoption of risers and the manner of choosing their location and height. In cases where shell thicknesses are greater than the customary ¼-in., some type of riser is necessary to allow for the escape of entrapped gases.

Basic principles underlying the application of gating and design are the same for both ferrous and nonferrous metals. Many of the aforementioned features dealing with gray iron and malleable foundry practice might just as appropriately have been written from the nonferrous foundryman's point of view.

In the early development of shell molding, the majority of castings studied used a vertical gating system. During the ensuing years a great deal of information was collected and today many foundrymen are in a position to apply this information in designing a vertical gating system for a new casting. When molds are poured off vertical-



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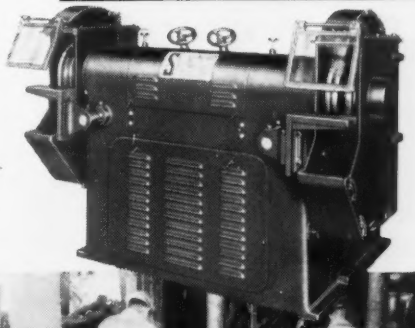

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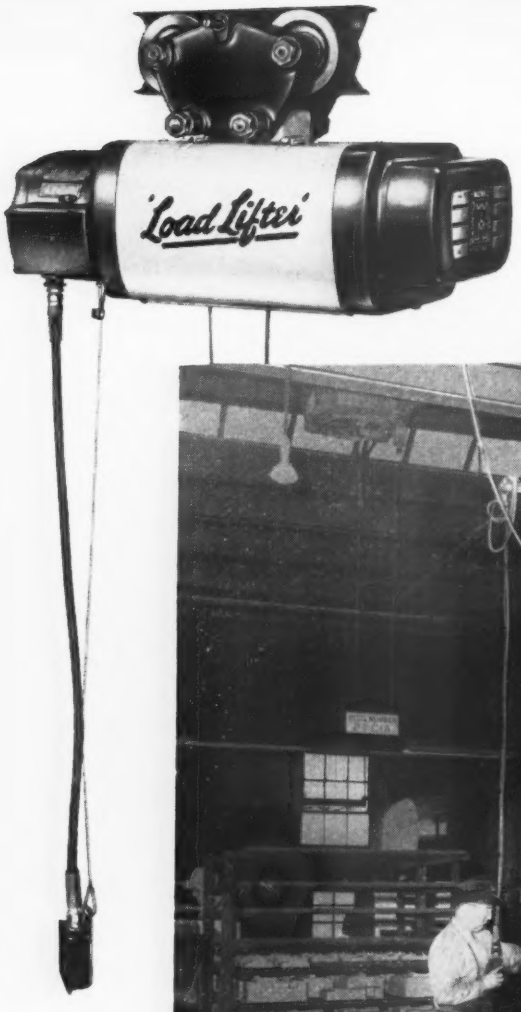

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ly, there is a tremendous saving in floor space required in the pouring area compared to that required for conventional sand molding.

More recently there has been a strong trend toward pouring shell molds horizontally. At first glance this method appears to require as much floor space as conventional sand molding. However, increased space requirement is offset in two ways. First, molds having a horizontal parting line are usually positioned for pour-off so that they overlap one another, leaving only the sprue of each mold clear. Second, stack molding frequently is employed when shell molds are blown rather than dumped. Molds may be blown to have a mold surface on both sides of the shell. If the shells are designed to fit one on top of the other with a common down sprue, as many as ten to twenty molds may be poured off in one stack.

Pattern Design—Casting designers often are unwilling to admit their responsibility for defective castings, and foundrymen may be obliged to sustain scrap losses before official instructions are issued to increase or decrease the cross-sectional area of the pattern at certain locations. Following are some general principles of proper design.

The soundness of a shell mold casting is not only a function of gating but of pattern design as well. Sudden changes in cross sections should be discouraged. Generous application of tapered sections is advisable. Sharp re-entrant angles that develop stress concentration are to be avoided. Stresses caused by uneven contraction and expansion promote rupture or distortion in the high-temperature ranges. In addition, casting design should insure a temperature range during investment of not more than 50° F, to assure uniform cure and consistent thickness of the shells. Therefore, it is desirable to design patterns free from abrupt cross-sectional variation. Pronounced sectional changes may be lessened by contouring some parts of the pattern. Fortunately, shell molding allows considerable latitude for designing parts, and shell castings are finding application for parts previously considered impractical to cast.

Arranging the Gates—Gating for shell molding may be arranged as indicated in Fig. 1. The down sprue has a 3 to 1 ratio. It is desirable that the cross-sectional area of the runner be greater than the lower portion of the tapered sprue in order

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to reduce the velocity of the metal. However, in practice, for purposes of conserving metal, this is often dispensed with. Bottom gating methods have proved particularly effective in minimizing turbulence. The slag trap is introduced to insure soundness in castings.

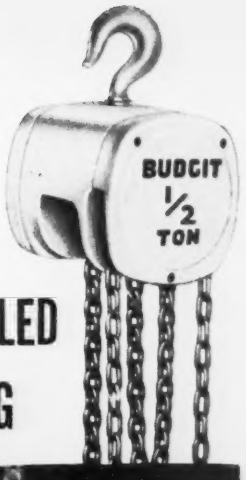
To obtain the highest casting yield the arrangement of the individual patterns and the gating technique must be considered carefully. A slag trap is desirable if there is room for it on the pattern plate. Some foundrymen prefer to omit the slag trap if possible and obtain an extra casting. Shell mold experience has shown that castings fed from an up sprue, as in Fig. 2, are consistently cleaner than those gated from a down sprue. The great mechanical strength of the shells allows nearly all of the pattern plate area to be utilized.

A slag trap at the bottom of the down sprue, as in Fig. 3, guards against entrained dirt reaching the mold cavity and its subsequent presence in the finished product. The up-turned ends of the runner act as a further precautionary measure against slag entering the casting. The tendency for slag to enter the second tier of castings is more pronounced. Hence, the metal is choked on both sides of the slag trap. The riser allows the escape of entrapped gases.

Fig. 4 shows a pattern used for brass or bronze shell molding. In the pouring of 85-5-5-5, it is essential to prevent turbulence. Quiet flow of metal is promoted by the tapered down sprue. Castings poured off an up sprue are consistently cleaner than those gated from a down sprue. The riser assures sufficient volume of metal for feeding. Pouring temperature, extremely important, should be kept near 2200° F. The metal should be poured slowly. Skimming of the metal immediately prior to pouring also helps to produce sound castings.

Offers Free Booklet on Safety

The text of a paper entitled "Safety in the Ironfoundry" has been published as a 16-page illustrated booklet by the Council of Ironfoundry Associations, London, England. The paper was read earlier in the year before a conference of the Royal Society for the Prevention of Accidents by Colin Gresty, chairman of the council's safety committee. Copies are obtainable free from the secretary of the council at 14 Pall Mall, London, S.W.1., England.



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ELECTRIC FURNACE MEETING DRAWS 960

Degasification of Steel Is Conference Topic

By EDWIN BREMER
Metallurgical Editor

ATTENDANCE at the annual Electric Furnace Steel Conference, Dec. 7-9, hit a record with registration of 960 members and guests. Meeting was held at William Penn Hotel, Pittsburgh. Announcement was made that the 1956 conference will be held at the Morrison Hotel, Chicago, Dec. 5-7. Newly elected officers who will direct that conference are D. L. Clark, Simonds Saw & Steel Co., Lockport, N. Y., who will serve as chairman, and Victor E. Zang, Unitcast Corp., Toledo, O., vice chairman.

Opening session at Pittsburgh dealt with better utilization of electric furnace electrodes through shop training programs. This was discussed by J. W. Shea, National Carbon Co., New York, and W. M. Exton Jr., Great Lakes Carbon Corp., New York. Both speakers described highlights of programs developed by their respective firms which are available to the electric furnace steelmaking industry.

The afternoon session pertained to degasification methods. Adam J. Texter, Firth Sterling Inc., McKeesport, Pa., said practice in his plant involves three steps. First is blowing oxygen in the furnace which, in addition to its primary application for oxidizing carbon and controlling chemistry, also improves quality and eliminates dissolved gases. Second step is blowing the furnace charge with dry air with a dew point below minus 60°F. Air at 30 psi is admitted to the bath through a ¾-in. pipe lance, which is pushed to the bottom and moved around to provide a good mixing action. Final step is use of a fluorine-bearing resin in the ladle. Material is polytetrafluoroethylene containing 76 per cent fluorine; in doughnut form, it is attached to a rod and plunged to the bottom of the ladle.

L. F. Barnhardt, Atlas Steels Ltd., Welland, Ont., briefly described his firm's practice of flushing the molten bath with dry air and argon. The latter is used when dry air appears to have a deleterious effect, and on such steels as 321 stainless, valve steels, and aircraft quality steels which undergo Magnaflux examination.

Highlight of the session was the description of the vacuum degassing process developed by Gussstahlwerke Bochumer Verein A.G., Bochum, Germany. A paper prepared by Arthur Tix was presented by his colleague, Werner Coupette, followed by an excellent motion picture of the process. Two procedures, differing only in the receptacles receiving the steel, are used. In one the molten steel is poured into ingot molds, and in the other the steel is poured into a ladle.

Ingot mold or ladle is placed in a large top-opening, insulated degassing chamber, and a heavy steel cover placed in position. The cover, which has a small opening for admission of the molten steel, is sealed with a thin aluminum plate. Degassing chamber is outgassed at the rate of 5000 cu meters per hr (2907 cfm). A bottom-pour ladle containing the molten steel from the furnace is set down on the cover of the chamber, with the nozzle above the aluminum plate. Seal between ladle bottom and cover is a rubber gasket. Stopper rod in the ladle is raised and the molten steel cuts through the aluminum plate almost instantaneously. Stream entering the evacuated chamber is broken up turbulently by the dissolved gases being removed, and flows into the mold or ladle. Process is claimed to provide steel with low gas content.

On Friday, two sessions devoted to the steel foundry field included such topics as furnace roofs, effect of nitrogen, chromium reactions, quality control and furnace operation. In the morning session H. G. Hart, Harbison-Walker Refractories Co. Pittsburgh, presented a paper prepared in co-operation with F. H. Fanning on "Monolithic and Shaped Refractories for the Electric Furnace Roof" which briefly described use of special silica-brick shapes, standard silica-brick sizes including roof-brick and electric-furnace-roof series as well as monolithic materials.

D. A. Finch, National Malleable & Steel Castings Co., Melrose Park, Ill., gave a brief resume of roofmaking practice at his plant using brick, while P. R. Gouwens, Fahralloy Co., Harvey, Ill., described the method of making a rammed monolithic roof. He pointed out that considerable care and practice are required to obtain satisfactory roofs. Rammer is held at an angle of about 45° during ramming so that any possible laminations will be approximately perpendicular to the face and minimize spalling.

"Effect of Nitrogen on the Solidity of Medium-carbon and Low-alloy Steel Castings" by John H. Fuqua, Stanley Foundries, Huntington Park, Calif., was presented by Jack Absalom, American Steel Foundries, East Chicago, Ind. Investigation by the author led to the conclusions that soluble nitrogen contents above 0.010 per cent raise tensile strength and yield point of medium-carbon steel, and can cause surface or "skin" porosity when poured in green sand. Soluble nitrogen content above 0.015 per cent produces a rimmed action in 1 per cent Cr-0.20 per cent max C steel poured in green sand. Addition of 3 to 4 lb per ton of 50 per cent SiTi to the ladle suppresses those gas reactions in green sand practice.

In another paper, "Chromium Reactions in Acid and Basic Furnaces", Sam F. Carter, American Cast Iron Pipe Co., Birmingham, Ala., presented numerous data on a variety of melting practices in acid and basic lined electric furnaces for making high-chromium steels. He pointed out that acid practice averages about 7 per cent higher chromium loss on 17 per cent chromium steels. Since that difference means about $50 a ton at present-day prices, basic practice is more economical.

H. H. Johnson and G. A. Fisher,

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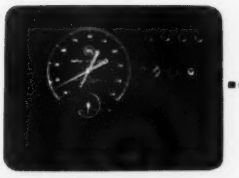

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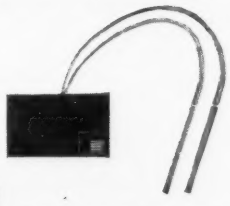

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National Malleable & Steel Castings Co., prepared a paper on "Quality Control of Melting Practices." It was presented by Mr. Johnson and described the procedures employed at the Sharon, Pa., works of the firm. Control begins with careful weighing of the metal charge components. During melting, data are obtained on melt-down carbon, which permits close control of the oxygen blow, manganese content for proper additions of that element to bring it within the desired range, and bath temperatures in the furnace, when the metal is tapped, and when it is poured in the molds. In addition, information is plotted on charts on electrode consumption, time of heats and physical properties. All data are posted on quality control charts available to the furnace operators, who follow them closely to maintain the heats within the prescribed limits.

At the final session, Willett Tibbetts, Canadian Car & Foundry Co., Montreal, discussed electric arc furnace operation and practice. He pointed out that acceptance standards are becoming more critical, and the foundryman must maintain good data to evaluate his work. Metal charges used in his foundry consist of 40 per cent plate scrap and 60 per cent open-hearth steel casting returns, with pitch coke and iron ore on the bottom. Acid practice is employed, and the charge on meltdown shows an active boil with a fluid slag. Heat is blocked on the way down to obtain a carbon content of 0.22 per cent. Slag viscosity shows 3½ to 4 in. with the Herty viscosimeter. On tapping, aluminum and calcium-silicon are added at the spout into the ladle. Metal temperatures are obtained with immersion-type thermocouples, and fluidity by means of a spiral test.

Meeting concluded with a general discussion of problems relating to furnace operation.

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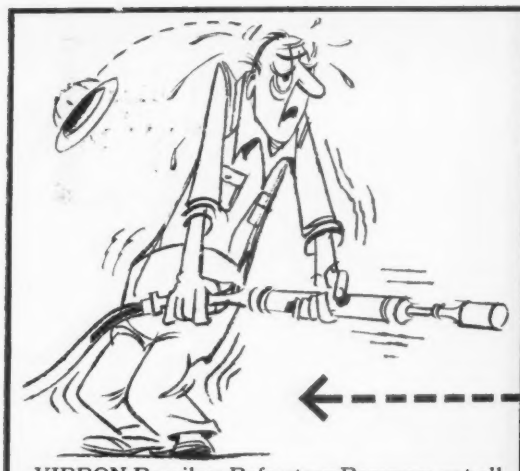

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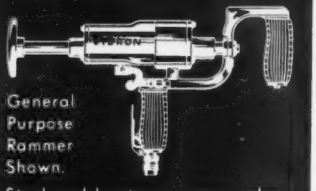

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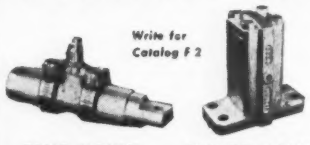

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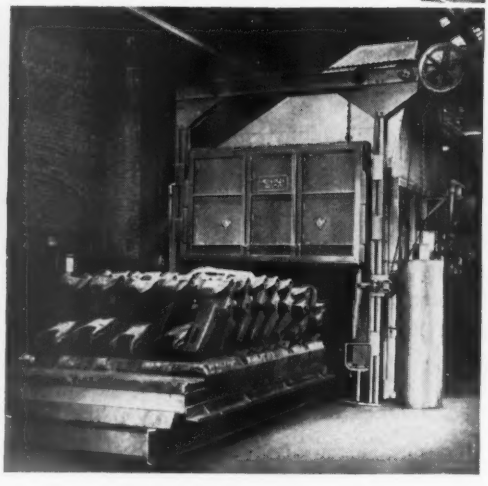

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TRADE . . Publications

For More Details Use Reply Card—Page 171

INDUSTRIAL EQUIPMENT: R. C. Mahon Co., 6565 Eight Mile Rd., Detroit 34, Mich.—Catalog A-656 presents photographs and information on industrial equipment installations including metal cleaning and pickling, drying and baking ovens, core and mold baking ovens, dust collectors and fog filters, conveyor racks, sludge segregators and filtered air supply systems.
For More Details Circle No. 141—Page 171

PRODUCT DIRECTORY: Beryllium Corp., Reading, Pa.—Directory lists and describes characteristics of company's line of beryllium-copper, beryllium-aluminum and beryllium-nickel alloys; beryllium metal and beryllium oxide; wrought, forged and cast beryllium copper alloys and beryllium copper safety tools.
For More Details Circle No. 142—Page 171

FRICTION MATERIALS: World Bestos Division, Firestone Tire & Rubber Co., New Castle, Ind.—Heavy-duty friction segments to provide fade-proof braking power for cranes, power shovels, hoists and other types of industrial equipment are described in catalog 648.
For More Details Circle No. 143—Page 171

FUME CONTROL: Wheelabrator Corp., 505 South Byrkit St., Mishawaka, Ind.—"Electric Furnace Fume Control News" offers a general discussion on use of local exhaust ventilation and cloth filter collectors for electric furnaces to control dust and fumes produced in electric steel making.
For More Details Circle No. 144—Page 171

DRYERS: C. M. Kemp Mfg. Co., 405 East Oliver St., Baltimore 2, Md.—Design features, principles of operation, flow diagrams, elevation drawings and engineering data on desiccant type dryers for drying air, gases and liquids are found in bulletin D-100.
For More Details Circle No. 145—Page 171

FIRE: Boston Manufacturers Mutual Insurance Co., 225 Wyman St., Waltham 54, Mass.—Folder presents 14 questions to aid management in checking on the soundness of its fire protection planning.
For More Details Circle No. 146—Page 171

CO_2 PROCESS: Liquid Carbonic Corp., 3100 South Kedzie Ave., Chicago 23, Ill.—Bulletin 33A offers general information on techniques and equipment required to make cores and molds by the carbon dioxide sand hardening process.
For More Details Circle No. 147—Page 171

WIRE ROPE SLINGS: American Chain & Cable Co., 929 Connecticut Ave., Bridgeport 2, Conn.—Wall

chart for wire rope slings lists diameters and lifting capacities of strand-laid type slings. Chart is edged top and bottom with metal strips and is suitable for display in industrial plants.
For More Details Circle No. 148—Page 171

FINANCING PLAN: Chicago Apparatus Co., 1735 North Ashland Ave., Chicago 22, Ill.—Illustrated brochure describes a financing plan for establishment or expansion of industrial laboratories in small or medium size companies. Companies may finance the purchase of a complete laboratory, or laboratory supplies and equipment, over a three-year period.
For More Details Circle No. 149—Page 171

VERNIER CALIPER: George Scherr Co., 200 Lafayette St., New York 12, N. Y.—Illustrated circular describes dull-chrome finished vernier scales reportedly rustproof against atmospheric conditions and perspiration from hands. Dull finish is said to reduce glare and reflection, resulting in faster, more accurate readings.
For More Details Circle No. 150—Page 171

INDUSTRIAL TRUCKS: Elwell-Parker Electric Co., 4205 St. Clair Ave., Cleveland 3, O.—Catalog illustrates and describes complete line of power industrial trucks and attachments. Engineering service through which special trucks or modifications of standard models are made also is detailed.
For More Details Circle No. 151—Page 171

CONVERSION TABLES: Barber-Colman Co., Wheelco Instruments Division, Rockford, Ill.—Bulletin F7255 gives thermocouple temperature millivolt equivalents. Temperatures are expressed on the international temperature scale of 1948. Electromotive force is expressed in absolute units.
For More Details Circle No. 152—Page 171

HEAT TREATING: Sargeant & Wilbur Inc., 180 Weeden St., Pawtucket, R. I.—Folder contains descriptive fact sheets on heat treating furnaces and atmosphere generators, both electric and fuel fired. Specifications, special advantages and important features are highlighted.
For More Details Circle No. 153—Page 171

CRUCIBLE MELTING: Crucible Manufacturers' Association, 27 William St., New York 5, N. Y.—"Proper Burner Design and Furnace Combustion Pay Dividends," No. 5 in a series of booklets, provides information designed to aid production of better castings at lower costs by increasing efficiency of crucible melting operations.
For More Details Circle No. 154—Page 171

FLUXES AND ALLOYS: Kawecki Chemical Co., 220 East 42nd St., New York 17, N. Y.—Data sheets on titanium-aluminum, titanium-boron-aluminum, boron-aluminum and zirconium-aluminum alloys and potas-

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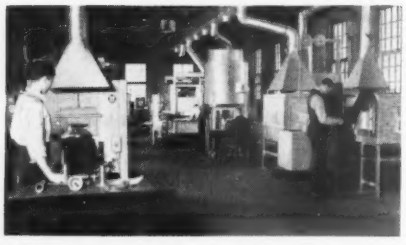

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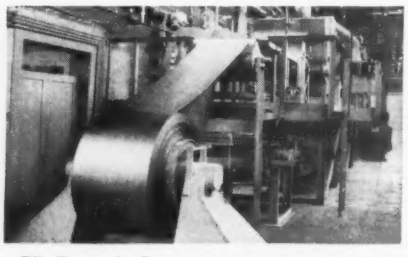

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sium titanium fluoride, potassium zirconium fluoride and potassium fluoroborate are available. Information includes chemical and physical properties, typical analyses and uses.
For More Details Circle No. 155—Page 171

GAGE BLOCKS: Webber Gage Co., 12912 Triskett Rd., Cleveland 11, O. Photographs, line drawings, charts and detailed descriptions of gage blocks and accessories, optical flats, interferometers and temperature meters are in catalog 56. A section on care and handling of gage blocks is included.
For More Details Circle No. 156—Page 171

SURFACE TREATMENTS: Texas Alloy Products Co., P. O. Box 19067, Houston, Tex.—Metal surface treatments manual was written to aid in selecting metal surface treatments for metal parts to resist wear, heat and corrosion. Treatments are applied in company's plant or by consultation on their use.
For More Details Circle No. 157—Page 171

BUILDING SIDING: Joseph T. Ryerson & Sons Inc., P. O. Box 8000-A, Chicago 80, Ill.—Mansard pattern stainless steel siding for single sheet and sandwich wall building construction is described in bulletin. 70-5.
For More Details Circle No. 158—Page 171

FORK LIFT TRUCKS: Towmotor Corp., 1226 East 152nd St., Cleveland 10, O.—Series of "fact folders" is designed to help manufacturers select materials handling equipment for specific operations by detailing advantages, specifications, operating and engineering data on line of lift trucks and tractors.
For More Details Circle No. 159—Page 171

CONTROL VALVES: Ross Operating Valve Co., 120 East Golden Ave., Detroit 3, Mich.—Advantages, operating details, features and cutaway views of pilot operated introld and retrold valves and direct operated valves are covered in bulletin 101B.
For More Details Circle No. 160—Page 171

SAFETY CONDUCTORS: American MonoRail Co., 13107 Athens Ave., Cleveland 7, O.—Insul-8-Bar systems for safety electrification of company's cranes and monorails are described in catalog, "Insulated Contact Conductors." Systems are designed for use with either new or existing installations, indoors or out.
For More Details Circle No. 161—Page 171

CAST IRON ART: United Oil Mfg. Co., 1429 Walnut St., Erie, Pa.—Historical brochure describes the Lamprecht Collection of Cast Iron Art owned by the American Cast Iron Pipe Co., and displayed in the Birmingham Museum of Fine Arts.
For More Details Circle No. 162—Page 171

CRANE SCALE: Harnischfeger Corp., Milwaukee 46, Wis.—Bulletin C-47 describes and illustrates an electronic crane scale that weighs every

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No wonder they call it . . .

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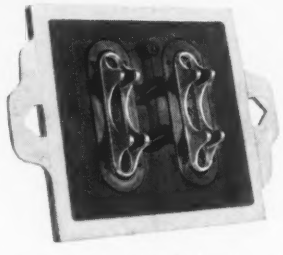
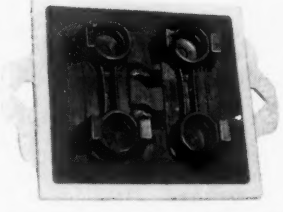


● Cope side shows 3" high white metal section set in SUPER TAMASTONE. Due to thin projections 2 ram-up cores must be used.



● Drag side is entirely of SUPER TAMASTONE with 3½" draw cup pattern.

PRODUCTION STEPPED-UP 600% HERE!

With original loose pattern equipment only 35 molds—castings per day were possible. With SUPER TAMASTONE plates shown here 110 molds—220 castings were delivered. All the foundry did was make a duplicate SUPER TAMASTONE pattern. Original and duplicate were then gated together in a 14x16 flask to make match plate. Check photos—see how simple it was.

Super Tamastone will work wonders in your foundry too. Write!

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lets you read temperatures directly—instantly

The Simplified

PYRO

Optical Pyrometer

Weighs only 3 pounds—pays for itself in a short time in reduced spoilage. It's the only self-contained and direct reading unit for quick and accurate measurement of molten iron, steel, monel, etc. No charts or accessories needed. Stock ranges from 1400° F. to 7500° F. Write for free Catalog No. 85.

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PYRO

Surface Pyrometers

Ideal for quick, precise surface temperature measurements of shell moldings, core oven, mold and die temperatures. Designed for ruggedness and accuracy. Features automatic cold-end compensator, big 4¾" direct reading dial. Available in 5 standard ranges; 0-300°F. to 1200°F.; also special and sub-zero ranges. Write for Catalog No. 168.

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PYRO

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Helps assure low-cost, sound, uniform non-ferrous castings. Resists rough usage. "Protected Type" and "Bare Metal" thermocouples instantly interchangeable. Ranges from 1000-2500°F. Write for Catalog No. 155.

The Pyrometer Instrument Co.

Bergensfield 6, New Jersey

Write for other catalogs on Micro-Optical, Indicating and Radiation Pyrometers.

load while it is being handled. Capacities up to 200,000 lb are available.

For More Details Circle No. 163—Page 171

SPECTROMETERS: Baird Associates Inc., 33 University Rd., Cambridge 38, Mass.—Bulletin 44 offers details of direct reading spectrometers featuring automatic servo monitors to keep the optical system in alignment at all times. Operation and construction of the units are outlined with diagrams and photographs.

For More Details Circle No. 164—Page 171

VALVES: Mar Vista Engineering Co., 5420 West 104th St., Los Angeles 45, Calif.—Bulletin contains information on series of solenoid-operated valves in a wide variety of configurations with operating ranges from 0 to 5000 psi, temperature ranges from −65 to +275° F and flow rates to 10 gpm.

For More Details Circle No. 165—Page 171

AIRFOIL FANS: Chicago Blower Corp., 9869 Pacific Ave., Franklin Park, Ill.—Function and design of eight general categories of axial airfoil fans for ventilating under all kinds of conditions are explained in bulletin AA-1101.

For More Details Circle No. 166—Page 171

ELECTRIC TRUCK: Lewis-Shepard Products Inc., Watertown, Mass.—Circular 34C describes with photographs, drawings and specifications a walkie-type electric pallet truck that is 25⅞ in. longer than the fork length.

For More Details Circle No. 167—Page 171

POWER PLANT: Allis-Chalmers Mfg. Co., Tractor Group, Milwaukee, Wis.—Catalog MS-455 includes specifications, cut-away views, photographs and design, engineering and performance data on a four-cylinder, 60-hp stationary power unit.

For More Details Circle No. 168—Page 171

CLAMSHELL BUCKETS: Erie Strayer Co., Erie, Pa.—Specifications, prices, work sheets and general data on single line, two, three and four line and special type clamshell buckets are available.

For More Details Circle No. 169—Page 171

pH EQUIPMENT: Bristol Co., Waterbury 20, Conn.—Bulletin Q1305 contains price and specification information on pH recorders and controllers for use with Beckman electrodes and amplifiers.

For More Details Circle No. 170—Page 171

COUPLING: Snap-Tite Inc., Union City, Pa.—Bulletin 240 illustrates and describes a quick-connect, quick-disconnect coupling. Detailed cutaway drawing, dimensions and ordering information are included.

For More Details Circle No. 171—Page 171

CORE OVENS: Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, O.—Folder asks and answers 17 questions pertinent to use of dielectric core ovens.

For More Details Circle No. 172—Page 171

Use the new

Cleveland VG 2 Core Box Vibrator.

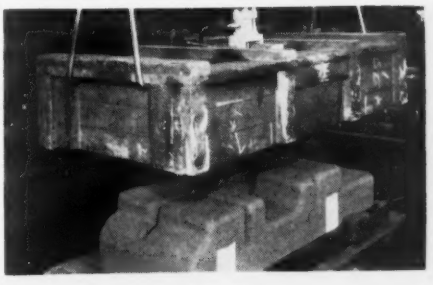
ELIMINATE SLEDGING

INCREASE CORE PRODUCTION

DRAW FASTER AND CLEANER

NO CORE DISTORTION

SAVE CORE BOXES



Designed specifically for large core drawing, this portable vibrator develops 8000 Vibrations per minute, adjustable for varying core sizes. Now in stock in Cleveland and San Francisco.

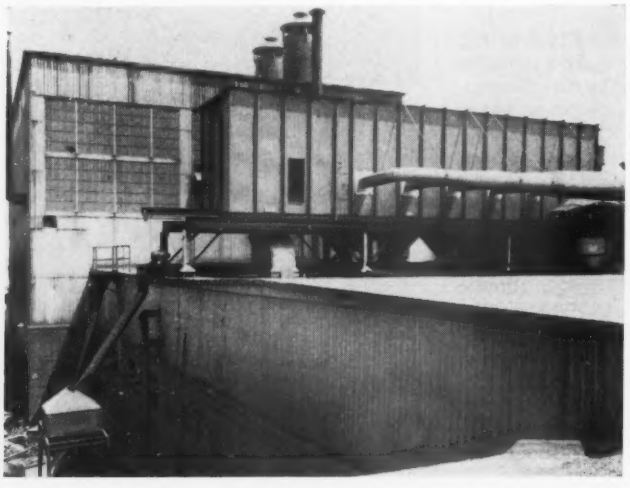
$78.20 FOB Cleveland

2788 Clinton Ave. • Cleveland 13, O.

The Shakeout

Collector Gathers Dust from Shakeouts

FOUR CUBIC YARDS of shakeout dust are trapped each two-shift day by this dry-type collector in use at Auto Specialties Mfg. Co., St. Joseph, Mich. Auto Specialties has three shakeouts, which receive a total of about



90 tons of sand per hour. In addition, a facing sand mixer which mixes 4 tons of sand per hour is connected to the system.

Hoods placed in underfloor sand tunnels for local exhaust ventilation pass air at high velocity. This air gathers particles of dust before they escape, and ductwork carries the dusty air to the collector. A dry-type collector was used to avoid corrosion from sulphur in the sand. Because of the fine particle size of the dust, a cloth-filter-type collector was chosen. Designed by Wheelabrator Corp., Mishawaka, Ind., it filters about 30,000 cfm of ventilating air.

For More Details Circle No. 207—Page 171

Coating Protects Cast Aluminum Signs

CAST ALUMINUM signs and markers, used in all types of climates, require proper painting in order to remain highly visible and useful. Lake Shore Markers, Erie, Pa., solves the finishing problem by using a wash-primer type

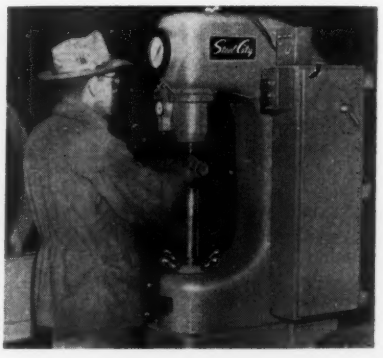
of coating made by Specialty Coatings Inc., a division of Thompson & Co., Oakmont, Pa.

One application of the product, called Vinsynite, phosphatizes and deposits a thin organic film which forestalls corrosion and provides maximum adhesion for finish coats of paint. One type is for use on nonferrous metals, another for ferrous metals. Its use is followed by application of specifically formulated vinyl finishes.

For More Details Circle No. 208—Page 171

Colored Lights Indicate Brinell Hardness

COLORED LIGHTS on a brinell hardness tester indicate relative hardness of pump housings made at Century Foundry Division of Century Electric Co., St. Louis. By using three differently colored lights, the "color-glance" tester eliminates the need for the operator to make borderline decisions. Testing is at the rate of 250 pieces per hour. Once standard limits have been established, castings which are too hard, too soft or within range can be picked out by watching a flash of light and then are sorted accordingly into receptacles.

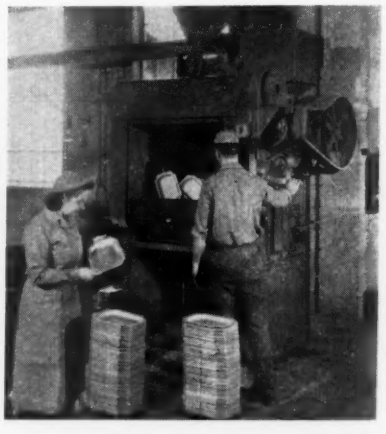


The specifications for the pump housing call for a hardness range of 130-175 Bhn. Loading is manual, with the operator starting the otherwise automatic cycle. Parts are tested in their as-cast condition, without any additional handling required for spot grinding. The tester is manufactured by Steel City Testing Machines Inc., Detroit.

For More Details Circle No. 209—Page 171

Airless Blast Barrel Does Two Jobs

AIRLESS BLAST BARREL cleaning of cast aluminum steak trays does two jobs simultaneously for R. C. Hitchcock & Sons Inc., nonferrous jobbing foundry in Minneapolis. The chilled cast iron grit cleans the trays to show up any imperfections during quality control inspection, and at the same time it gives a frosted finish which is attractive to buyers. The top surface of the tray then is polished to mirror smoothness and contrasts pleasingly with the frosted finish on the bottom surface.



A dust collector operates as a unit with the barrel and in addition receives dust from two grinding wheels. The collector salvages over 350 lb of aluminum per week besides keeping the plant free from dust. Both the barrel and the collector are products of Pangborn Corp., Hagerstown, Md.

For More Details Circle No. 210—Page 171

SILICAMIX . . . a new, superior, gun-shot CUPOLA PATCH

BUCKEYE SILICAMIX is a new development that provides a superior gun-shot mix for patching gray iron cupolas. Its uses provide the same qualities and results from this gun-shot material that have been so popular with the well known Buckeye Silica Firestone. Buckeye Silicamix is actually small pellets of this firestone, coated with clay—a special refractory fire clay. When applied under pressure with water, Buckeye Silicamix sticks tighter to the cupola walls, keeping costly "drop" to a minimum.

Try SILICAMIX on your next cupola lining job . . . . . .

A Buckeye refractory engineer will bring you free samples for inspection and trial. See for yourself how its faster "buckshot" action adds up to more economical cupola operation.

SILICA CHEMICALS, INC.

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AMHERST, OHIO

You'd need several machines to do all the different jobs possible on one

BOKOE No. 3 Universal Miller

For non-ferrous, cast iron and alloy steel tooling, patterns and production to close tolerances.

Use it for radial drilling in addition to vertical milling, universal milling and boring up to 11⅞".

- Column swivels 180° in either direction
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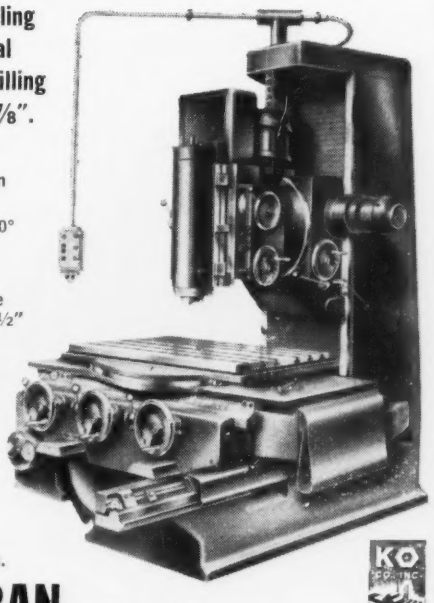
- 37½" throat
- Distance between table and spindle head 0-37½"
- Rotary table handles bulky work up to 8'2"
- Weight 7½ tons



Smaller models, too.
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Careful balancing makes Penn Buckets self dumping when loaded and self righting when empty. Welded construction prevents "clinging" makes them empty easily and completely.

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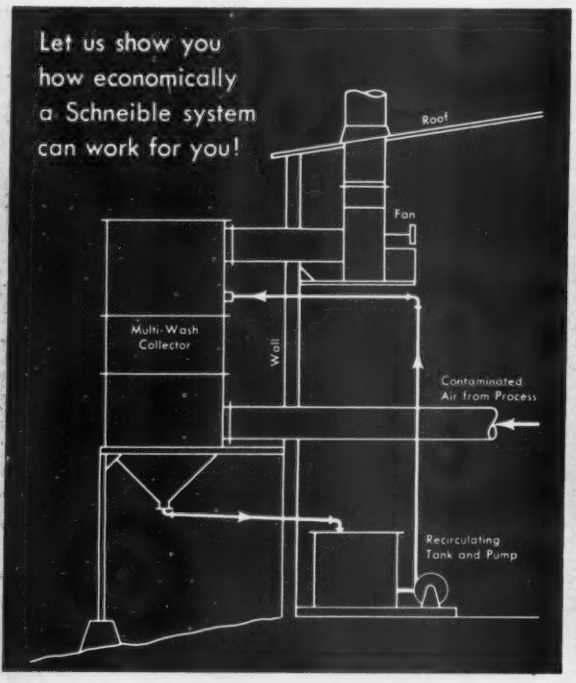
Self-Dumping

PENN IRON WORKS, INC.

READING, PENNA.

SPECIFY SCHNEIBLE DUST CONTROL

for simplicity and efficiency



Wherever you see a Schneible Dust Control System you'll find an efficient, profitable operation.

Whether it be Cupola Collectors, Hoods for pouring, shakeout, casting cooling, grinding, tumbling or Multi-Wash Collectors in operation on one of its many diversified uses, you can be sure that economy and efficiency was a determining factor in the choice of Schneible Dust Control Equipment.

The simplicity of the design of Schneible Systems assures low maintenance cost and practically no sacrifice of valuable working space, while providing profitable production through better employee and public relations.

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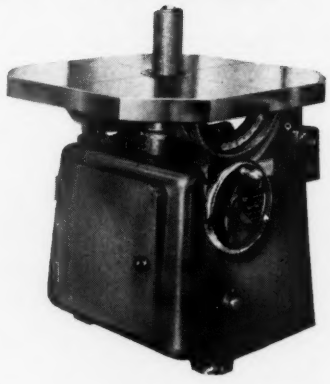
New OLIVER Spindle Sander

Heavy duty Spindle rotates and oscillates to give you more accurate patterns



This Oliver sands difficult patterns smoothly, quickly. Its 1-inch spindle rotates at 1800 r.p.m. and oscillates 1⅛" with 56 strokes a minute. Spindle tilts up to 45° toward operator, 5° away from him. Takes drums 2", 4", 6" diameter, 9" long. Spindle has 3" vertical adjustment to provide full use of sanding area. Write for Bulletin 381.

Oliver makes an extensive line of Disk and Spindle Sanders and other woodworking equipment for pattern shops

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DO MORE WORK AT LESS COST

because they deliver more power per cubic foot of air consumed, are light in weight for easier maneuverability and they retain their new tool power longer.

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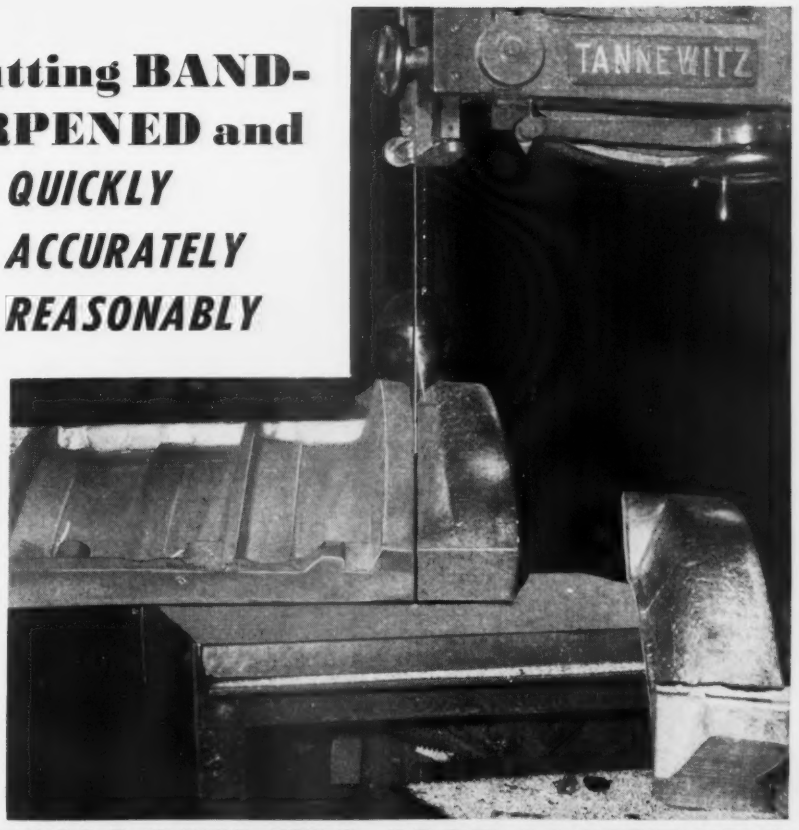
Nonferrous metal-cutting BAND-SAW BLADES SHARPENED and REPAIRED . . . . . *QUICKLY ACCURATELY REASONABLY*

The Lenox blade you see here in a Tannewitz machine is one of our responsibilities. We keep it sharpened and repaired for the Harsch Bronze and Aluminum Foundry, Cleveland, where it gets plenty of hard service. Photo shows it sawing a large riser from a heavy aluminum casting. Jobs like these are rough on bandsaw blades—and that's why our services are so helpful. We keep these blades sharp; we adjust the teeth, check the pitch, and keep life in blades that otherwise are headed for the scrap pile. If you use metalcutting bandsaws, we can save you money by taking care of your blades. Just ask us; we'll show you. Write today:



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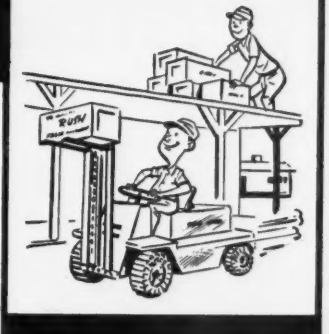

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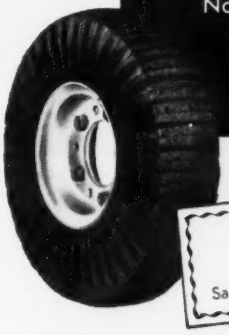

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$15
1/16" to ¼" pipe size
Any length nozzle desired

A squeeze of the trigger and the Murphy Pistol Sprayer instantly shoots a stream of blackening into inner pockets that could never be reached by old-fashioned brush or swab method. Designed by a foundryman, the Murphy Pistol Sprayer is ideal for cleaning permanent molds—aluminum and other metal, and for sand blasting.

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EXTRA LONG NOZZLES FOR ⅜" SIZE

This size Sprayer can be furnished with nozzles up to 48" long for spraying ingot molds and hard to reach places . . . also available with curved nozzles up to 15" long.

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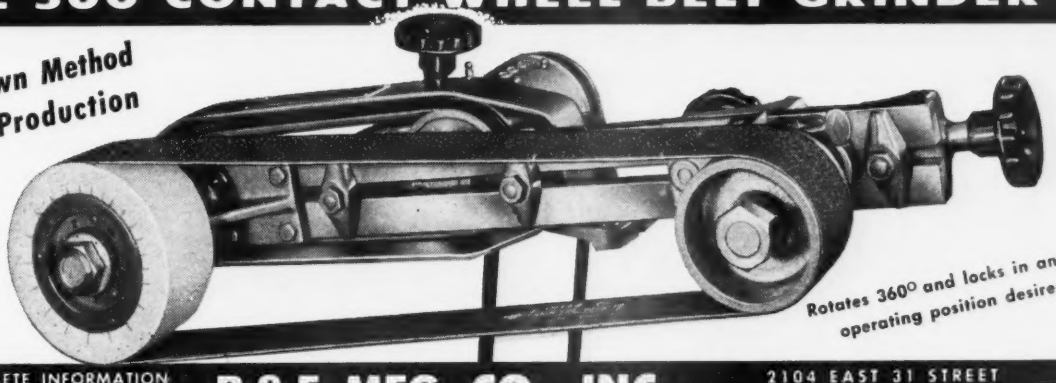

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Baker & Adamson Alkali Fluoborates are easily-handled purifying salts which the foundryman can use like precision tools for a wide range of purposes when casting magnesium, or when melting, heat treating or refining aluminum.

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When used as a purifying flux in aluminum melting, B&A Potassium Fluoborate improves the mechanical and physical properties of the casting, resulting in increased tensile strength, greater elongation, improved machinability. These results are obtained with the addition of just one to four ounces per hundred pounds of metal.

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In magnesium casting, B&A Alkali Fluoborates are used with both green sand and core sand to provide a protective atmosphere which prevents oxidation. Foundries using these fluoborates have obtained better castings with fewer rejects. Also, core making is easier and the resulting cores are faster to collapse and easier to shake out.

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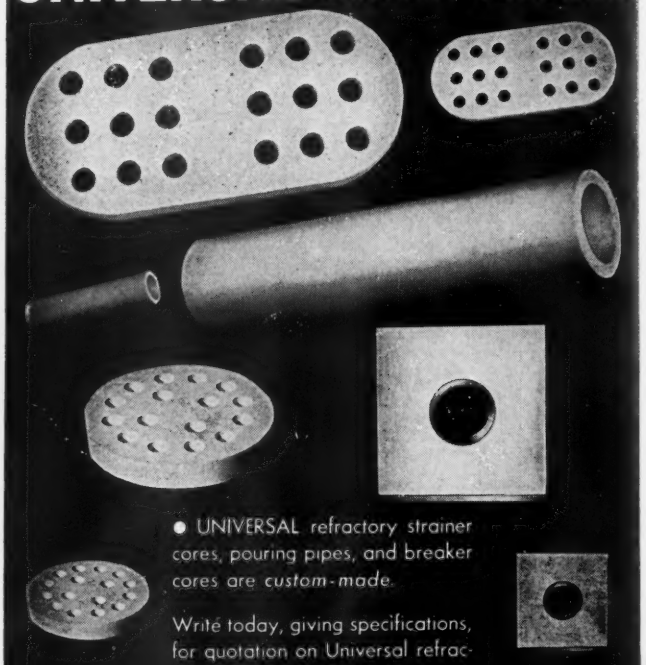

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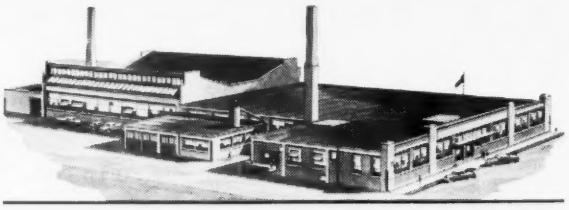

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cut scrap losses with Ni-Rod "55" electrodes!

This cast iron support for an 8-foot metal shear seemed headed for the scrap heap. Broken in a freak accident, it would have taken weeks to replace. But the machine was needed right away for emergency orders.

A weldor examined the break and made a suggestion: repair the casting with Ni-Rod "55"* electrodes. It didn't take him long. The whole job — grinding the fracture open, filling it in with weld metal — took only 3½ hours. No preheat or postheat was needed. The shear was back on the job the next day!

Salvage defective castings, too

With Ni-Rod "55" electrodes, foundries find it is easy to save many castings . . . to fill in blowholes . . . to build up undersize and mismachined areas . . . to repair cracks or breaks. Even weldors of limited experience get sound, machinable welds with this easy-to-handle electrode.

Another big advantage of Ni-Rod "55" electrodes: *welds match the color of cast iron closely.*

New booklet on cast iron welding!

Find out more about this money-saving electrode. "A Handy Guide To Welding Cast Iron" gives helpful tips about salvaging castings, weld preparation, technique, getting maximum machinability . . . tells of successful welding *others* have done. Just write:

*Registered trademark

The INTERNATIONAL NICKEL COMPANY, Inc., 67 Wall St., New York 5, N.Y.

INCO TRADE MARK **Welding Products**

Electrodes • Wires • Fluxes

CLASSIFIED ADVERTISING

Help Wanted

FOUNDRY SUPERINTENDENT

REQUIRED FOR FULLY MECHANIZED NONFERROUS FOUNDRY

Applicant must have extensive experience in all phases of foundry procedure and supervision, including Electric Furnaces—Metallurgy—Foundry—Millroom—Pattern Shop and Stores.
Experience on Valves—Fittings—Plumbing Supplies—an asset.
Some knowledge of Synthetic Sand Practice and Shell Molding an advantage.
Age and Salary open.
Reply in confidence to:

PERSONNEL MANAGER
BOX 698
LONDON, ONTARIO, CANADA

FOUNDRY SUPERVISOR

Progressive manufacturer of gray and alloy iron castings in central Ohio needs additional supervision in molding division. Experience in floor molding with sand-slinger preferred. Excellent opportunity for right person. All replies answered and condifential. Write stating full qualifications and salary requirements. Address: Box 822, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SALES ENGINEER

Well established southeast foundry offers excellent opportunity to aggressive sales engineer in foundry and structural steel. Send full qualifications in first letter. Address: Box 839A, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Help Wanted

FOUNDRY METALLURGIST

Midwest foundry producing carbon and low alloy steel castings has an opening for a plant metallurgist. Salary Open.

BOX 864, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY TECHNICIAN

Young man with Industrial Engineering degree or equivalent and some foundry experience for the development of methods and practices in a light metals foundry.
Position offers excellent opportunity with an expanding organization. Send resume of experience and personal background to:

BOX 867, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY SUPERINTENDENT

Want modern, control-minded direction of Midwest Malleable Foundry producing mechanized and semi-production jobbing castings. Must think ahead and participate in modernization program while improving quality and reducing costs. Real opportunity and challenge at adequate salary and bonus. Reply giving personal data and salary requirements.

BOX 866, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

SUPERINTENDENT

Small gray iron foundry. Complete charge. Producing light and medium work. Experienced in supervision of personnel. Must have executive ability. A career in a growing company. Forward full resume. Address: Box 838, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Help Wanted

WANTED

Sales engineer or sales executive to understudy and succeed sales manager of steel foundry who will retire within several years. Responsibilities include sales and product application, sales promotion and management. Preferred age early 40's. Location — east. Detailed resume should accompany all replies.

BOX 836, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

OPPORTUNITY

For Metallurgist or Engineer interested in the precision casting field to do engineering-sales work for producer offering every chance to advance with the business. Experienced production know-how and product contact necessary. Address: Box 840, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY ENGINEER

Challenging position in management engineering for young foundry engineer prepared to travel. Must know gray iron foundry operations, able to make layout drawings. Industrial engineering experience desirable. Reply with photo and state age and salary required. Address: Box 808, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Help Wanted

FOUNDRY RESEARCH METALLURGIST

Experienced in basic electric and Open Hearth practice, carbon and low alloy steels. Position permanent and now open. Give complete information in first letter. Must furnish acceptable references. Information will be held in strict confidence by a single executive.

BOX 813, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY ASSISTANT

Foundry Assistant needed by captive Bronze and Aluminum foundry. Prefer experience in Bronze and Aluminum tablets, memorials and commercial castings, must have experience in plant efficiency, planning, research and operation. Age 30 to 35, with approximately 12 to 15 years' experience.

Salary open and commensurate with qualifications. Good opportunity for the right man.
Give personal history, experience, reference and salary expected.

BOX 845, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

METALLURGIST

Midwest production gray iron foundry requires services of man capable of taking charge of metal and sand laboratory and supervising cupola and electric furnace operations. Please advise qualifications and salary.

BOX 873, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

RESEARCH CHEMIST

Long established producer of extensive line of foundry supplies needs an enterprising Research Chemist, with foundry experience background. Excellent opportunity. Reply should include age, education, experience, salary requirement, recent photo.

BOX 858, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

MOLDING FOREMAN

Experience in gray iron foundry. located Middlewest. Salary commensurate with ability.

BOX 874, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

MELTING FOREMAN

FOR MECHANIZED GRAY IRON FOUNDRY.

New England Foundry needs experienced gray iron man, to supervise cupola operation, assume responsibility for inoculants and alloy additions and run routine foundry tests.

Excellent opportunity for ambitious young man. Submit full particulars and experience, references and present situation in reply.

BOX 821, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

MOLDING FOREMAN

For Eastern Nonferrous jobbing foundry specializing in Bronze Alloys and Aluminum. Either salary or substantial hourly rate. One who can take a job and see it through to completion with minimum effort. Write giving personal history, references and salary or rate desired. Our own men know of this advertisement. Address: Box 816, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT
(Aluminum)

Small job shop offers an excellent opportunity for man with experience in large pressure castings. Must have full knowledge of metals, sand controls and rigging for large aluminum castings. Give complete details in first letter.

BOX 837, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

METALLURGIST

Large gray iron foundry in Central Wisconsin. Responsible for cupola melting, metal control, and laboratory supervision. Also experience required in electric furnace practice.
Give personal history, references and salary expected.

BOX 846, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

DESIGNERS-DRAFTSMEN-ENGINEERS

Experienced in foundry layouts and equipment. Age 30-45. Send experience record, personal data, recent photo and references.

BOX 865, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

HELP WANTED

Foundry Cupola Superintendent or Metallurgist needed for Acid and Basic Cupola, located in Denver, Colorado. Reply to:

THE ELECTRON CORP.
Foundry Division
P.O. BOX 208
LITTLETON, COLORADO

ELECTRIC FURNACE MELTER

New modern steel foundry has opening for two experienced Melters with electric furnace experience. Excellent wages and working conditions. Foremen's status. Strike conditions prevailing. Replies held confidential. Lower central valley California location. Ideal climate.

BOX 841, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY ASSISTANT

Foundry assistant needed by captive gray iron foundry of medium size heavy process machinery manufacturer. Young college engineer graduate preferred. Should have had some foundry experience. Is to help increase plant efficiency, planning, research and operation. Company has liberal profit sharing plan. Salary open. Location S.E. Pennsylvania. Address: Box 843, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

METALLURGIST

For malleable iron foundry in East, to work into complete control of product from melting through annealing. Knowledge of pearlitic malleable would be helpful. Should appeal to man who wants to be his own boss. This is a small organization. Please give full particulars regarding background and salary desired in first letter. Address: Box 847, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOREMAN—WANTED

Medium-sized New England Gray Iron Foundry in process of mechanizing.
Excellent opportunity for aggressive person to make a showing.
Doing squeezer and rollover work.
In reply state experience and salary required. Replies will be held confidential.

BOX 870, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

TECHNICAL SALES REPRESENTATIVE

Young man, college trained; some foundry experience preferred. This is a salaried position in the Chicago area with a national company in foundry materials. Excellent opportunity for aggressive, personable man. Limited travel, car and expense; outstanding employee benefit program. Send resume to:

BOX 835, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

HELP WANTED

We desire to set up our production of small steel castings on a piece-work basis instead of hourly rates. We need the services of someone who is thoroughly familiar with such an operation, capable of installing this system in our foundry. Salary open. All replies confidential. Address: P.O. Box 13294, Houston, Texas.

Positions Wanted

MANAGER OR SUPERINTENDENT

Thirty-five years' practical experience in foundry, molder eighteen years. Have been foreman, superintendent and general manager. Did consultation work in various foundries. One was losing $7,000 per month when I started, in seven months it was making good money. Ran three largest foundries in St. Louis, largest one in Chicago. Understand gray iron, semi-steel, brass, aluminum. Know how to rig jobs to get best production at lowest cost. Understand running of cupola mix of various metals; estimating jobs from blueprints. Can give best of references. Available immediately. Address: Box 852, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

EXPERIENCED PRACTICAL FOUNDRYMAN

Desires position in nonferrous, brass and aluminum jobbing and production shop. Very well versed in all phases of foundry operations. Journeyman molder by trade, 20 years' experience in aluminum and brass jobbing and production. Knowledge of melting, core work, machine and loose pattern. Knowledge of alloys, special gating techniques and problems. Am 37 years old and at present employed as superintendent of nonferrous jobbing and production shop. Would like to locate on West Coast. Address: Box 868, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERVISOR-TECHNICIAN

Forty-two years' experience as molder, foreman and superintendent. Expert in producing non-slip safety treads, abrasive integral part of surface, all metals, including antimony lead castings for chemical industry. Many customer leads. Also experienced gray and alloy irons, brass, bronze, aluminum, cupro-nickel, Ni-Hard, Ni-Resist. All melting, basic and acid cupola practice. Practical chemistry and metallurgy. Some shell molding, synthetic sand and control. Excellent health, locate anywhere. Permanent or consulting. Address: Box 872, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CORE ROOM FOREMAN

Age 47, experienced in all phases of coremaking. Rig boxes for all types of coreblowers. Very good on production and handling personnel. Will relocate. Would be interested in selling foundry supplies. Address: Box 859, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Thorough knowledge of all phases of nonferrous metals. Understand gating, jobbing, floor, machine and plumbers supplies. Can also produce pressure tight and porous free castings. Know sand control and core room work. Address: Box 854, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

EXPERIENCED PRACTICAL FOUNDRYMAN

On both iron, steel and manganese steel. Have been general foreman, superintendent and consultant. Married and 56 years old. Best of references. Address: Box 853, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CLASSIFIED ADVERTISING

Employment Service

FOUNDRY PERSONNEL SPECIALISTS
National Placement and Procurement of
GENERAL AND PLANT MANAGERS, PLANT SUPERINTENDENTS, FOREMEN—ALL DEPARTMENTS, METALLURGISTS, ENGINEERS, CONTROLLERS, ACCOUNTANTS, SALESMEN, SALES MANAGERS, PERSONNEL DIRECTORS, PURCHASING AGENTS.

Confidential Inquiries Invited
From Employers and Qualified Applicants.

For Fast Competent Assistance Contact
DRAKE PERSONNEL, INC. **HARRISON 7-8600**
JOHN COPE, DIRECTOR **220 SOUTH STATE ST., CHICAGO, ILL.**

Positions Wanted

HIGH ALLOY STEEL FOUNDRY SUPERINTENDENT

Seeking challenging, responsible operations or staff position with progressive steel foundry. Age 37, metallurgical and engineering background. High qualifications electric melting, gating and heading, sands and refractories, labor relations, plant administration. Pioneer in shell molding, successful foundry research and technical development history. In charge of foundry operations for large alloy steel shop in east. Address: Box 848, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

POSITION WANTED

Sand control, heavy industrial steel casting. Thirty years' foundry experience (jobbing shop). Fifteen years sand control. Know the causes of adhesion, penetration, fusing and scabs. Can eliminate same and reduce cleaning cost. Presently employed. Would like to make a change. Address: Box 860, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRYMAN

Foundry Engineer, age 36, with broad operating and engineering experience in jobbing and high production covering steel, malleable, and iron, seek connection with good progressive organization. Go anywhere. Address: Box 811, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT FOREMAN

Desire position in gray iron or nonferrous, jobbing or production. Well versed in all phases of foundry operation. Practical and Technical. Fifteen years in supervisory positions, available immediately. Address: Box 863, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SALES ENGINEER AVAILABLE

Now covering Chicago and 200 mile radius. Fifteen years' experience in ferrous and nonferrous castings, including product development and supervisory experience. Desire salary and expenses. Address: Box 871, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

PATTERN AND FOUNDRY FOREMAN

Desire position in steel foundry or other foundries as supervisor, where hard work will pay off in the way of advancement. Experienced pattern construction, heading, gating. Prefer pattern shop foreman job. Relocate. Married. Address: Box 851, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SALES POSITION WANTED

Young executive ferrous foundryman with technical education and broad experience in steels, gray irons, and malleables wants sales position with progressive foundry or challenging management job with potential. Now managing medium sized gray iron foundry. Address: Box 857, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

WORKS MANAGER-SUPERINTENDENT

Capable of operating a 350 man organization, 23 years of experience in casting ferrous and nonferrous metals in sand, permanent and investment molds profitably. Address: Box 849, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MELTER

Young ambitious man. Ten years' practical foundry experience. Six years' experience as melter—two years of this time as head supervisor in melting operations. Address: Box 850, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Consulting Engineer

ELECTRIC FURNACE CONSULTANT BACIC AND ACID PRACTICE

Supervisor on electric furnaces for 35 years. Thorough knowledge of:
1. All kinds of plain carbon and alloy steel.
2. Analysis control.
3. High standard of physical properties.
4. Low Cost with high productivity.

EUGENE H. WEAK **2933 HIGHWAY AVE.**
HIGHLAND, IND. **PHONE: TEMPLE 8-1244**

CONSULTANT

Specializing in quality control by installing the correct techniques for **CENTRIFUGAL CASTING, PERMANENT MOLDING** and sand molding of brass and bronze castings. Address: LEIGHTON M. LONG, TONTOGANY, OHIO. PHONE: TONTOGANY 3065.

Representatives Wanted

OPPORTUNITY KNOCKS!

A prominent, aggressive manufacturer of foundry equipment, expanding into automatic mold blowing and other automatic equipment, has openings for ambitious sales-engineers, for the nation-wide promotion of automatic core and mold blowers. Must have sales-engineering background and be willing to travel. Unusual opportunity for advancement and achievement. In reply, include recent photo, age, complete resume of experience, education, present lines and territory, salary expected.

BOX 862, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

SEVERAL EXCLUSIVE TERRITORIES

For aggressive organizations now calling on foundries, all types. No supply houses wanted unless you offer capable equipment engineering and service. Nationally advertised, well known line includes shell molding equipment, core blowers, core draw machines, combination blower and draw machines, molding machines, miscellaneous foundry equipment, custom-building and testing equipment. Liberal commission. Address: Box 869, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SALES REPRESENTATIVES

Through our advertising in FOUNDRY and other trade magazines, we are receiving inquiries for our strainer cores, pouring pipes and other ceramic specialties. We require experienced sales representatives to contact these interested prospects and introduce our line of products to all foundries in several good territories. Please give detailed information about yourself and other lines handled in first letter. Address: MR. C. L. EVANS, UNIVERSAL CLAY PRODUCTS CO., SANDUSKY, OHIO.

Accounts Wanted

ACCOUNTS WANTED

Equipment and supply company, covering state of Wisconsin with good following, desires additional lines. Interested in heavy equipment, melting furnaces, flasks, etc. Address: Box 825, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Opportunity

PERMANENT MOLD METHOD AVAILABLE THE WAGNER PERMANENT MOLD CO., 2910 Empire Ave., Burbank, California, has developed a Permanent Mold Method for ferrous and nonferrous metals and invites inquiries from any country regarding this method and process.

NONFERROUS FOUNDRY

North Texas industrial center. Jobbing, squeezers, rollover, Newago sandhandling. Established customers, recently expanded. Need capital, consider managing partner. Sales cover all southwest.

BOX 834, FOUNDRY
PENTON BLDG. **CLEVELAND 13, OHIO**

Wanted-To-Buy

WANTED TO BUY

Sterling Type Flask
19" x 21" with 12" cope and 12" drag
24" x 28" with 12" cope and 12" drag
36" x 36" with 15" cope and 8" drag
42" x 42" with 15" cope and 8" drag
48" x 48" with 18" cope and 10" drag
26" x 42" with 11" cope and 10" drag
or sizes reasonably close

1—Molding machine J & J #1020 RC, Jolt rollover pattern draw with turn table (or similar)
1—Molding machine J & J #1020 RC rollover pattern draw with turn table (or similar)

BOX 832, FOUNDRY
PENTON BLDG. **CLEVELAND 13, OHIO**

ELECTRIC AND POWER EQUIPMENT WANTED

1—16,000 to 18,000 KVA, 3 ph., 60 cy., furnace trans. or 3-6000 KVA, 1 ph. trans., 13,200 pri. to 150-250 V. sec., full load.
3—Electric furnaces, top charge, tilting, 6 ton cap. with or without trans. 13,200 V. pri., 100-200 sec.
1—Used steel building, approx. 75 ft. x 100 ft.

INDUSTRIAL MOTOR SERVICE
207 VANDERVOORT STREET
NORTH TONAWANDA, NEW YORK

WANTED

3 Phase Direct Arc Furnaces, rated ½ to 1 Ton capacity, complete with all parts other than transformer and controls associated with transformer room. Top charge of no interest.

BOX 855, FOUNDRY
PENTON BLDG. **CLEVELAND 13, OHIO**

WANTED

Match plate or original patterns for unusual decorative accessories. Will pay cash. Address: VIRGINIA METALCRAFTERS, WAYNESBORO, VIRGINIA.

WANTED TO BUY

One-quarter or one-half ton acid electric furnace. Address: Box 844, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MIXERS WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price or immediate acceptance. Address: Box 578, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CLASSIFIED ADVERTISING

Available Capacity

AVAILABLE CAPACITY

Aluminum and magnsium foundry. Immediate open capacity on castings up to 500 pounds.
Contact:

JOY MANUFACTURING COMPANY
NEW PHILADELPHIA, OHIO

Capacity Wanted

WANTED GRAY IRON CASTINGS

Volume user of small castings seeks contact with foundry capable of giving prompt service. Reply should contain information concerning machining capacity and ability. Address: Box 861, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Foundries For Sale

FOR SALE OR LEASE
GRAY IRON FOUNDRY

Fully equipped job-shop with No. 4 Cupola; 24,000 Sq. Ft. Building on 1 acre of land. 90 mi. SW of Chicago.

BOX 827, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY FOR SALE

Brass foundry and machine shop, manufacturing marine hardware, propellers and fire fighting equipment in Vancouver, Canada. Good opportunity of securing a going business. Address: Box 831, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

For Sale

FOR SALE

American Wheelabrator Tumblast 36" X 42", complete with Dust Collector and controls	$3250.00
American No. 1A Tablast 7-14" multi-tables	900.00
Tabor 10" power molding machines	110.00
Tabor 10" jolt squeeze swinghead	225.00
Osborn 2047-4 Jolt rollover pattern draw machines, size of table 17" X 24", 8½" draw	200.00
Preheat oven 6' wide X 6' deep X 4' high, 600 degrees F. complete, unused	1500.00
Burring Booth Newcomb Detroit magnesium, 15 HP motor, unused	1200.00
Uniwash dust collector, 5600 CFM, Newcomb Detroit, 10 HP, 3/60/220	1000.00
American Rotoclone Dust Collector, sludge type, 2500 CFM 5 HP, 3/60/220	750.00
Core Oven 10' X 7' X 4', Gehnrich with controls	350.00
American Dustube No. 185, capacity 16950 CFM with 25 HP motor and blower	1800.00
Suction Cabinet, McLeod 5' X 3'	275.00
Detroit Brinell Hardness Testers	150.00
Tinius Olsen tensile testers	100.00
Vertical disc grinder 30" Gardner, 7½ HP	600.00
Wire Cutter Climax ¼-⅝	250.00
Pangborn EN2 Cabinets, complete with Dust Collector	475.00
Tinius Olsen Brinell Hardness Tester, motorized, 4500 kg	350.00

M. ELSTEIN
426 GRAND ST.
JERSEY CITY 2, N. J.

For Sale

FOUNDRY EQUIPMENT

16—Pot-type Aluminum Holding Furnaces, 600 Cap. Shell 48" dia. x 35⅜" Hi. with McKee burners and "Wheelco" Capacitrol No. 241 temperature control and indicator. 0-1600° F.
Grinder, pedestal type, dbl. end 12" wheel, model 102 Cincinnati w/2 hp motor less stand, serial No. 75055.
Polishing Machine, 10" ped type, 2 wheel w/5 hp motor, Mitchell, serial No. 739.
Crusher & Pulverizer, Williams w/25 hp motor. Metal Crusher, New Century.
Pulverizer, Model SF w/10 hp motor, Jeffrey Jr. 220/440 V.
Magnetic Separator, Dings 24" w/3 hp motor, serial No. 14350.
Wire Cutting Machine, Lewis #7 w/½ hp motor.
Furnace, heat treat, electric salt bath, 40 KW, serial No. 27914.
Furnace, heat treat elec. vert. type, temp. 1000°, Young Bros.
12 ft. lift, 120 KW max, load 1000#.
Furnace, heat treat, Bellevue #555, serial No. 17015.
Hoist, 1 ton, Chic Pneumatic, serial No. 604.
Air Hoist, type P, size 2, 3000# cap. Detroit.
Scale, floor type, 12,500# cap. Howe, 8' x 6' platform, serial No. 1180390.
(2) Blowers, 10" American.
Blower, #3P American, Sirocco, serial No. 51331.
Blower, American, Sirocco #3V, serial No. 6326.
Blower, American, Sirocco #5.
Blower, American, Sirocco #5V, paddle type w/5 hp motor.
Blower, #5V w/5 hp motor. American, Sirocco, serial No. 12576-1.
Blower, American, Sirocco, #5-V w/5 hp motor.
Blower, American, size 5½ Sirocco, serial No. 7498A.
Blower, Buffalo Forge #23.
Blower, #7 type C1 Clarage.
Blower, Clarage, type SPEC size 13 w/3 hp motor, serial No. 104019.
Blower, paddle type, approx. 3' dia. x 10" w, w/3 hp motor.
Dust Collector, cloth bag type, Parsons 33'4" x 8'8" w x 21'6" high.
Dwg. A-5619-1A-4680 Sq. Ft. filtering area w/ motors.
Dust Collector, wet type 500 CFM "Uni-Wash"
Spencer-Turbo Compressor blower 550 CFM 20 oz., 220 volt motor, 3 hp.
Spencer-Turbo Compressor blower 150 CFM 24 oz., 220 volt, 2 hp motor.
Spencer-Turbo Compressor blower 85 CFM 20 oz. lot 15802, 220 volt, serial No. 18017.

BOHN ALUMINUM & BRASS CORP.
1400 LAFAYETTE BLDG.
DETROIT, MICH.

SAND BLASTING EQUIPMENT

We Buy, Sell and Trade
What-Do-You-Want—We-Will-Find-It-For-You

15 x 20	Wheelabrator with dust collector	$1600.00
27 x 37	Wheelabrator, rubber belt	3000.00
36 x 42	Wheelabrator, steel belt	3500.00
42 x 48	Wheelabrator, steel belt	3500.00
48 x 48	Wheelabrator, steel belt	4500.00
15 Inch	Continuous Wheelabrator	3000.00
6 ft.	Wheelabrator, flat top	2500.00
9 ft.	Pangborn L.F. Table (one side throw wheel)	4000.00
9 ft.	Pangborn L.F. Table (two side throw wheel)	5000.00
6 ft.	Pangborn L.G. Table, 6 aux. tables	2500.00
1½ cu. ft.	Pangborn air blast barrel	350.00
ES-421	Pangborn shell blasting machine	3500.00

Tumbling Barrels, horizontal and vertical.
Hand Blast Cabinets—Pangborn, American and Ruemelin.
Dust collectors all sizes from 100 CFM to 5000 CFM.
New wear parts for Pangborn conveyor type blasting machine.
Dust collector, Pangborn CK 220, 2000 CFM.

DIAMOND SAND-BLAST, INC.
5654 WEST JEFFERSON
DETROIT 9, MICHIGAN
PHONE: VINEWOOD 3-6751

FOR SALE

1—Simpson Mixer #2, 20 HP motor.
Miscellaneous: Screens, Pulverizers, Grinders, Tyler Rotap Screens, etc.

Wanted: Your Idle Machinery.
OUR 39th YEAR.

CONSOLIDATED PRODUCTS CO., INC.
66 BLOOMFIELD STREET
HOBOKEN, NEW JERSEY
HO 3-4425 · N. Y. TEL. BA. 7-0600

For Sale

FOR SALE

MOLDING MACHINES
1—Herman, Jolt, Rollover Draw, 6000#, 40" x 63" table.
2—International, Jolt, Rollover Draw, 24" x 10G, Stationary.
2—International, Jolt, Rollover Draw, 20" x 8-G. Portable.
2—No. 275 Osborn jolt squeezers. Stationary.
CORE OVENS
1—Coleman Recirculating 3 section with 5 drawers per section. Gas fired.
1—Coleman Recirculating 4 section with 5 drawers per section. Gas fired.
BLOWERS FOR CUPOLAS AND FURNACES
1—Connersville Rotary Blower, 3500 CFM.
2—#7½ Roots rotary blowers—27 x 81—14000 CFM.
2—Connersville Rotary 14" x 27" HD, 2750 CFM at 5# press.
1—Connersville rotary blower 22 x 66 45 cu ft per revolution 9000 CFM.
Maxon-Premix Blowers for Gas ¼ to 1 HP.
2—2 HP 20-oz. Spencer Turbine Blowers.
2—Spencer Turbine Blowers, 3000 CFM, 24 oz., 30 HP, 3/60/220-440 V.
METAL MELTING EQUIPMENT
1—1000# open flame brass melting furnace, gas fired.
1—Hausfeld Stationary Brass, oil or gas burner, 200# cap.
1—Hausfeld Tilting crucible, gas, 250# Al, Cap.
1—Hausfeld 2000# aluminum capacity furnace, barrel type, open flame, oil fired.
MISCELLANEOUS
1—Beardsley & Piper Model S Screenerator.
1—Pangborn 1 to 4 nozzle air blast generator, complete.
1—Sullivan, 2 stage compressor, 14-8¾ x 10, 75 HP.
1—Sly Tumbler 24" x 40".
1—International SB-11 core blower.
2—Pangborn cloth screen collectors, 2 HP.
1—Stoney crane type shakeout.
1—NPD Royer sand separator.
1—#16 Roto-clone unit complete.
Complete stock of rebuilt mill and dust exhaust blowers.

CLIFTON MACHINERY COMPANY
1023 W. SIXTH ST. CINCINNATI 3, OHIO

FOR SALE

1—American Sand Cutter #74/50 Model AM
2—Osborn Rollover Machines #2047

KNOXVILLE FOUNDRY COMPANY
KNOXVILLE, TENNESSEE

FOR SALE

Air Hoists never used I. R. model "C" one ton cap. 15' lift. List price approx. $655.00, sale price $425.00.

Thor model #1020 never used 1,000 lb. cap. 20' lift. List price $455.00, sale price $295.00.

HAYNES EQUIPMENT CO., INC.
62 VOORHIS LANE
HACKENSACK, N. J.

FOR QUICK SALE

Mold and Sand Handling Equipment for 4 Squeezer Stations. Includes 4 hoppers, sand conveyors and mold conveyors. Ideal for nonferrous foundry. Never used equipment at a sacrifice price. Address: Box 856, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOR SALE

Whiting 36" x 78" exhaust tumbler, 1" shell with geared-head brake 7½ HP motor, excellent condition. Print on inquiry. Address: Box 833, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOR SALE

One Model 1324 Tyco Shell Molding Machine. Excellent condition. Address: LA PORTE FOUNDRY COMPANY, 301 TRUESDELL AVE., LA PORTE, INDIANA.

CLASSIFIED ADVERTISING

For Sale

FOR SALE

We have the best selection of HARD CHROME REBUILT PNEUMATIC TOOLS WE HAVE EVER HAD.

Ingersoll-Rand Size 24 Floor Rammers

Ingersoll-Rand Size 14 Bench Rammers

Cleco Bench Rammers

Chipping Hammers—All types

Core Breakers and Grinders

Our prices are about half the cost of new tools.

All tools sold by us are guaranteed and can be returned if found not satisfactory.

CENTRAL PNEUMATIC SERVICE COMPANY
512 LINDEN AVE., DAYTON, OHIO
TELEPHONE: MADISON 2701

PIT FURNACES

FOR SALE, RENT OR LEASE

14" x 16" L & N Elect. recirc. draw pit, 1400° F. Never used.
30" x 50" x 32" Lind. GF Recirc Draws, 1250° F. Nice!
3' x 15' Westinghouse, Hardening Pits, 1700° F. Reasonable!
44" x 60" Surface Combustion Rad. Tube GF 1750° F. Nice!
18" x 72" Industrial Heating GF Pits 1800° F & 2400° F.
COMPLETE HEAT TREATING PLANTS, GOOD GOING BUSINESSES IN VARIOUS SECTIONS OF THE COUNTRY. ALL OR PARTS! PLEASE CALL "COLLECT" TOWNSEND 8-8450.

METAL TREATING EQUIPMENT EXCHANGE
9825 GREELEY
DETROIT 11, MICHIGAN

FOR SALE

INGERSOLL-RAND AIR COMPRESSOR, TYPE XRE, Ser. #PP BE104-105—1939
175 HP Synchr. motor 220/3/60—2 stage 14" x 12" 6" x 12"
638-C.F.P.M.—470 C.F. Free Air P.M.
Max. Delvy. 450# PSI
Intercooler—Aftercooler
Automatic Lubricating System, with comp.
Elec. Mach. Automatic Control Panel—Size SPT-6.

SEABOARD STEEL COMPANY, INC.
P.O. BOX 1135
NEW HAVEN, CONNECTICUT

FOR SALE

PRESSURE CAST EQUIPMENT
TO CAST ALUMINUM
MATCHPLATES, PATTERNS AND
CORE BOXES. COMPLETE WITH
FLASKS, HOLDING POTS
AND BASE.

BUFFALO PATTERN CORPORATION
830 HERTEL AVENUE
BUFFALO 16, NEW YORK

FOR SALE

Case Overhead Traveling Crane, 5 ton cap., 40' span, cab controlled, 25 cycles—Euclid 3 ton cap., 22'6" span.

ABBOTT STEEL CO., INC.
699 BAILEY AVENUE
BUFFALO 6, NEW YORK

For Sale

FOR SALE

2—CUPOLAS, 68" O.D. FULLY EQUIPPED WITH ELBOW TUYERES, SKIP HOISTS, SPENCER TURBINE BLOWERS, 50" O.D. FORE HEARTHS AND FOXBORO INSTRUMENTATION. PURCHASE CAN BE NEGOTIATED VERY REASONABLY.

BOX 817, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOR SALE

TURBO BLOWERS WITH MOTORS

CFM	PRESS.	MAKE	CFM	PRESS.	MAKE
8375	20oz.	Spencer	340	20oz.	A-B
6000	32oz.	Ing.-Rand	320	12oz.	Spencer
4700	32oz.	Ing.-Rand	250	12oz.	No. Am.
2700	16oz.	Spencer	9000	6"SP	Northern
2500	7oz.	Sturt.	3420	8"SP	N.Y.
800	13oz.	Buffalo	2700	5⅝"SP	Ilg
500	12oz.	Buffalo	2500	½"SP	American
450	7oz.	Spencer	1100	4½"SP	Bayley
400	16oz.	No. Am.	2344	2"SP	Clarage
380	16oz.	No. Am.			

THE MOTOR REPAIR & MFG. CO.
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MOTORS—GENERATORS
TRANSFORMERS
Unused — Rebuilt
WORLD'S LARGEST INVENTORY
ELECTRIC EQUIPMENT COMPANY
Phone Station Collect GLenwood 6783
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FOR SALE

#4 Modern Cupola, blower, motor; Moulders' Friend; American sand cutters; Royer NB 2; Core Ovens; Core Blowers; Jolt Squeezers; many other items.

SOMIL EQUIPMENT & SUPPLY COMPANY
SOUTH MILWAUKEE, WISCONSIN
PHONE SO 2-3880 OR BR 1-7060

FOR SALE

FAIRBANKS MORSE DIESEL
GENERATOR
Two units—Total output capacity:
300 KVA, 440-60/3 phase
Complete switchboard; new 1946

UNIVERSAL MACHINE & EQUIPMENT CO.
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SHILLINGTON READING, PA.
PHONE: READING 7-1321

FOR SALE

Completely overhauled Roots-Connersville Blower, 3200 CFM; max capacity. Will sell for $1000.00 —F.O.B. Alpena, Michigan. Price does not include motor. Address: THUNDER BAY MFG. CORPORATION, P. O. BOX 317, ALPENA, MICHIGAN.

FURNACES FOR SALE

Ten used heat treating furnaces and two 7-ton gantry cranes. Good condition, priced to sell. Address: BAER STEEL PRODUCTS, INC., BOX 1428, BOISE, IDAHO.

FOR SALE

Small size American Wheelabrator 5 shelf core oven, aluminum furnace, many other items. Address: C. J. DOERR, 2425 N. ARMSTRONG, KOKOMO, INDIANA.

For Sale

MOVING TO NEW AND LARGER QUARTERS
NO REASONABLE OFFER REFUSED ON THE FOLLOWING BEFORE MOVING:

Jolt Squeeze Strip Molding Machines

720 PJ Osborn 31 x 44 table, 20" squeeze cylinder.
#724 PJ Osborn; 38" x 56" table; 24" squeeze cylinder; 11" jolt cylinder; 10" draw with hopper; 9" squeeze stroke; 4000 lb. cap. new in 1948; excellent condition; extra large size.
#163 Milwaukee—Table size 16" x 28"; actual capacity 16" x 44"; frame lift type; 1500 lb. capacity; also #143 and #183 Milwaukees.
Nicholls—Type B; 1945 machine; 14" cylinder; 14" x 36" table.
211 SPO.
213 SPO 19 x 26 table, 4½ jolt cylinder, 13" squeeze.
2114 SPO 14 x 24 table, 14" squeeze cylinder.

Jolt Stripper Molding Machines

559 Osborn 25 x 30 table, 1200 lb. jolt capacity.

Jolt Rollover Molding Machines

#918 Johnston & Jennings—44" x 54"; 18" draw; no pit required.
International—Type F; Table size 31" x 12".
Osborn Power Rollovers—Model 2047-4; Cap. 18" x 24"; stationary; 1942 machines.
Osborn #601; 750 lb. jolt capacity; 30" overall flask length.
Osborn #602; 750 lb. jolt capacity; 36" overall flask length.
Osborn #605; 750 lb. jolt capacity; 54" overall flask length.
SPO—Model #914; 14" cylinder; 30" capacity.
Tabor 30" x 40", extends to 69", 12" draw, shockless type, 1500 lb. cap.

Jolt Squeezers

Nicholls Type D Jolt Squeezer.
Osborn #275 J Jolt Squeezers; table size 16" x 20"; 10" squeeze cylinder diameter.
Osborn #276 jolt squeezers.

Push Off Machines

Champion Push off machine; Model LLA-45; table size 45" x 26"; used with sand slinger.
International Push off machine; Model LP—Portable pin lift; used with sandslinger.

Core Blowers — Core Rollovers — Core Draw Machines

#193 Osborn — for medium sized cores; equipped with air operated draw pistons.
#94 Osborn—for large cores.
Osborn Hand Rollovers—Model 42; table size 14" x 20½"; maximum width of Core Box —22".

Material Handling Equipment

Model HA Hough Payloaders—Rebuilt.
Clark Fork Lift Trucks—6000 lb. Capacity.
Lewis-Shepard Platform Lifts—6000 lb. capacity.
Baker Raulang Fork Lift Truck—6000 lb. with ready power unit.
Elwell Parker Fork Lift Truck—6000 lb. with ready power unit.
Yale Fork Lift Truck—6000 lb. with ready power unit.
Mercury Fork Lift Truck—2000 lb.—Electric.

Furnaces

Stroman 2000 lb. Tilting Hydraulic; New in 1944.

Core Ovens

Dielectric—Model 900A and 1800A.

Miscellaneous Foundry Equipment

U. S. 7½ HP 3 speed grinders; 28" wheel.
U.S. adjustable speed grinder, Model 64, 20" x 2" x 3".
Ingersoll-Rand pneumatic hoist with trolley, size "C."
Beardsley & Piper Sand Slinger, 19" head, 4" cup, 4' ramming arm.
#50 Beardsley & Piper Speedmuller.
Model S Beardsley & Piper Screenerators.
Climax Wire Straightener—#2; capacity ⅛" to ¼"; Ser. CWS 600-44.
Royer Screenerator.

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AIR COMPRESSORS

2—DAVEY Air Cooled, 315 C.F.M., 75 HP, New 1949.
1—INGERSOLL RAND 12" x 10", 320 C.F.M., 60 HP.
1—SULLIVAN Type WN-3, 20" x 12" x 14", 1220 C.F.M., 250 HP.

AIR HOISTS

75—INGERSOLL RAND RC-5, 500 lbs.
10—INGERSOLL RAND LC-7, 700 lbs.
3—Ingersoll Rand Size "A" 500 lbs.
6—INGERSOLL RAND Size "B" 1000 lbs.
2—INGERSOLL RAND Size "C" 2000 lbs.
2—INGERSOLL RAND Size "D" 4000 lbs.
4—INGERSOLL RAND Size "D-6" 6000 lbs.
4—INGERSOLL RAND Size "E" 10,000 lbs.
5—CHICAGO PNEUMATIC 2-3-5 Ton Cap.
16—DETROIT 1-2-5 Tons Cap.
3—THORS 2-3-5 Tons Cap.

BUCKET ELEVATORS

1—LINK BELT 30' Centers, 10" x 7" Buckets.
1—LINK BELT 35' Centers, 12" x 7" Buckets.
1—LINK BELT 40' Centers, 14" x 7" Buckets.
1—LINK BELT 50' Centers, 16" x 8" Buckets.

AIR TOOLS

200—INGERSOLL RAND & CHICAGO PNEUMATIC, Grinders, Chippers, Bench & Floor Rammers.

ELECTRIC HOISTS

1—Comet 1000 lbs. capacity.
1—SHAW Box 1000 lbs. capacity.
1—CLEVELAND 4000 lbs. cap. with powerized Trolley.
1—ROBBINS & MEYERS, 4000 lbs. cap.

CUT-OFF MACHINES

1—DEWALT Model MEZV, Cut-Off Saw, 10 HP Motor, Foundry Type.
3—TABOR model C10AF, Abrasive Disc, 16" Wheel, 10 H.P. Motor.
1—TESSEMER Model H, ¾" Cap. Sprue Cutter.
1—TESSEMER Model I, ¼" Cap. Sprue Cutter.

CORE ROD STRAIGHTENERS

2—AMERICAN Type D, Pneumatic ¾" Straightener, 1¼" Shear.
2—CLIMAX #2, 2A, 1/16" to ¼".
1—CLIMAX #3, ¼" to ⅜", Length 10".

CORE GRINDERS

2—MILWAUKEE Rotary Type, Model 70-12, 70" Dia. Table, Very Late.

CORE BLOWERS

2—CHAMPIONS CB 10, Max. Core 10 lbs.
2—CHAMPIONS CB 400, Max. Core 300 lbs.
1—DEMMLER No. 55 Max. Core 6 lbs.
1—DEMMLER No. 1, Max. Core 10 lbs.
1—DEMMLER No. 1-E, Max. Core 10 lbs.
2—DEMMLER No. 2K, Max. Core 20 lbs.
2—DEMMLER No. 2E, Max. Core 20 lbs.
2—DEMMLER No. 2, Max. Core 20 lbs.
2—DEMMLER No. 3, Max. Core 35 lbs.
2—DEMMLER No. 3K, Max. Core 35 lbs.
2—DEMMLER No. 3E, Max. Core 35 lbs.
1—DEMMLER No. 4, Max. Core 100 lbs.
1—DEMMLER No. 4E, Max. Core .. lbs.
2—INTERNATIONALS No. SB, 11 Max. Core 15 lbs.
2—INTERNATIONALS No. SB 13, Max. Core 30 lbs.
1—OSBORN No. 91, Max. Core 15 lbs.
2—OSBORN No. 92, Max. Core 35 lbs.
2—OSBORN No. 192, Max. Core 50 lbs.
2—OSBORN No. 193, Max. Core 75 lbs.
6—MILWAUKEE TACCONE Model A-3, Max. Core, 4 lbs.

CORE OVENS

1—INDUCTION Heating Dialectric, Model M-800A, 600 lbs. per Hr. New.
1—INDUSTRIAL "Revolving Carriers" Continuous, Trays 18" x 80", Gas Fired.
1—DETROIT Vertical Tower, 45' High, Trays 14" x 60", 31" Centers.
1—YOUNG BROS. 2-Comp. 10 Drawers, Overall 9' x 12' x 8', Gas Fired.
2—YOUNG BROS. Car Type, Single & Double Compartment, Gas Fired, Recirculating, with L & N Recorders, etc.

CORE ROOM MISC.

3000—TRANSITE Core Plates.
1—AMERICAN Rapid Core Machine.
37—NEW CORE RACKS, 5' 6" Wide, 6' High, 4' Deep, 5 Shelves, Knocked Down.
4—ROSS Single & Double Core Drawers.
20—OSBORN, INTERNATIONAL & TABOR Core Rollovers, Various Sizes.

CUPOLA BLOWERS & ACCESSORIES

1—ROOTS CONNERSVILLE, Size 20 x 44, 7000 CFM, Type HD, 50 HP Motor.
1—INGERSOLL RAND Centrifugal, Type FS-367 with 100 HP Motor.
1—INGERSOLL RAND Centrifugal, Type FS-357, 7000 CFM with 60 HP Motor.
1—BUFFALO FORGE 5E, 3200 CFM, 25 HP Motor.
4—LINDBERG Centrifugal Blowers 2100 CFM, with 15 HP Motors.
1—BASIC REFRACTORIES BRI Gun, Model 110.
3—HAUCK Cupola Lighter & Tanks.
5—WHITING 42" Dia. Charging Buckets.

DUST COLLECTORS & ROTO-CLONES

1—PANGBORN #423 CH, Bag Type, 3240 CFM. Complete & Knocked Down.
1—AMERICAN Air Filter No. 12, Type W, arrangement "C," with Sludge Ejector.
1—AMERICAN Air Filter No. 14, Type W, arrangement "C," with Sludge Ejector.
1—AMERICAN Air Filter No. 27, Type W, arrangement "C," with Sludge Ejector.
1—AMERICAN Air Filter Type N, Size 10 with Bench.
1—AMERICAN Air Filter Type N, Size 20, 20,000 CFM, with 75 HP Motor.
1—AMERICAN Air Filter Type N, Size 24, 24,000 CFM, 75 HP Motor.

ELECTRIC ARC MELTING

2—DETROIT Rockers. Indirect Arc, Type AA, 750-1000 lbs. capacity. Complete with 200 KVA Transformers, Control Panels, Automatic Electrode Holders, etc.
2—DETROIT Rockers. Indirect Arc, Type AA, 1000-1500 lbs. capacity. Complete with 250 KVA Transformers, Control Panels, Automatic Electrode Holders, etc.

GAS & OIL FIRED FURNACES

1—LINDBERG FISHER Model MNP, Size 225, Electric Tilt, with Motor & Blower.
6—LINDBERG FISHER Model MNP, Size 1700, Electric Tilt, with Motor & Blower.
3—LINDBERG FISHER Model MNP, Size 2400, Electric Tilt, with Motor & Blower.
2—LINDBERG FISHER, Type BB1, Size 225, Hand Tilt, with Motor & Blower.
12—LINDBERG FISHER, Model SSH, Size 550, Stationary, Complete Motor & Blower.
6—LINDBERG FISHER, Model SSH, Size 150, Stationary, Complete Motor & Blower.
3—LINDBERG FISHER, Model SSH, Size 60, Stationary, Complete Motor & Blower.
10—CAMPBELL HAUSFIELD, Stationary, Size 125 to 250, Crucible, Motor & Blower.
2—CAMPBELL HAUSFIELD, Model IPNT, Size 2000 lbs., Electric Tilt, with Motor & Blower.
1—STROMAN, Model MP, Size 125-175, Crucible, Electric Tilt, with Motor & Blower.

GRINDERS—SWING FRAME

1—MARSHKE, 12" x 2", 3 HP.
1—MARSHKE, 20" x 10", 10 H.P.
2—FOX, No. 6, 24" x 10", 15 HP.
1—U. S. ELECTRICAL, 24" x 10", 15 HP.

GRINDERS—SNAGGING

3—U. S. ELECTRICAL, No. 65, 24" x 3" x 12" Wheel, 15 HP, 4-Speeds.
3—U. S. ELECTRICAL, No. 65, 30" x 4" x 12" Wheel, 20 HP, 4-Speeds.
2—U. S. ELECTRICAL, No. 64, 14" x 3" Wheel, 7½ HP, 4-Speeds.
1—HAMMOND, Model WR-1, 24" x 3" x 12" Wheel, 10 HP.
2—SAFETY BITES, No. 174, 24" x 3" x 12", 10 HP.

GRINDERS—DISC

1—QUEEN CITY, Model 100 Double End Disc Grinder, wheel size 20" x 2" x 2", with 10 HP Motor.
1—U. S. ELECTRICAL TOOL, No. 80, Double End Disc Grinder, Wheel size 16" x 3", With 7½ HP Motor.

HEAT TREAT FURNACE

2—LINDBERG, Model 4860 GH, Gas Fired 48" x 60", Recirculating, with L & N Controls to 1250° F.
1—LOFTUS ENGINEERING CORP. Annealing, Walking Beam Type, Gas Fired, 1600°, Recirculating, 10' x 12' x 40', New 1951.
1—AMERICAN, Model 150-DC, ID 5" x 10" x 18", To 2350° F.
1—AJAX MFG. Electric, ID 54' Long, 46" Wide, 36" High, 800°. Single Phase.

INDUCTION—MELTING—HEAT TREAT

1—GENERAL ELECTRIC MG Set, 300 KW, 450 HP Motor, 3000 Cycles, with Starter & Panel Boards.
1—GENERAL ELECTRIC MG Set, 50 KW, 125 HP Motor, 960 Cycles, with Starter & Panel Board.
1—GENERAL ELECTRIC MG Set, 1250 KW, 1850 HP Motor, 3000 Cycles, with all Controls.
1—LEPEL Spark Gap Converter, 30 KW.

LADLES

3—WHITING Cylindrical, 275 lbs. 19" x 26".
6—MODERN Cylindrical, 1500 lbs. 29" x 30".
2—STEVENS Cylindrical, 2450 lbs. 29½" x 41½".
12—WHITING Lip Pour, 1200 lbs., 23" x 23".
6—MODERN Lip Pour, 1600 lbs. 24" x 24".
2—WHITING Lip Pour, 2000 lbs., 29½" x 29½".
3—WHITING Lip Pour, 4000 lbs., 32" x 32".
1—WHITING Lip Pour, 6000 lbs., 36" x 36".
3—WHITING Lip Pour, 5000 lbs., 34" x 34".
1—WHITING Lip Pour, 8000 lbs., 44" x 48".
1—WHITING Lip Pour, 17,000 lbs., 58" x 58".
2—WHITING Lip Pour, 20,000 lbs., 62" x 62".
2—WHITING "U" Type; 5900 lbs., 42" x 72" x 36".

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MOLDING MACHINES JOLT SQUEEZERS

8—OSBORN No. 275 JW, Straddle Type, 10" Cyl., Portable.
16—OSBORN No. 275J, 10" Cyl., Portable.
3—OSBORN No. 276J, 12" Cyl., Portable.
6—OSBORN No. 210 PJ, Swing Back Head, 10" Cyl., Stationary.
6—OSBORN No. 212 PJ, Swing Back Head, 12" Cyl., Stationary.
1—CHAMPION No. JS-10-P, 10" Cyl., Swing Back Head, Portable.
20—SPO No. 110J, 10" Cyl., Portable.

JOLT ROLLOVER PATTERN DRAW

1—B. & P. No. 920 RCX Rol-A-Draw, 44" x 54" Table, 20" Draw (New).
1—DAVENPORT No. 28R, 34" x 48" Table, 12" Draw.
1—DAVENPORT No. 40-SA, 42" x 50" Table, 3000 lbs. Jolt, 18" Draw.
1—HERMAN #6000 Series, 42" x 78" Table, 6000 lbs. Jolt Cap., 20" Draw.
1—HERMAN #1500 Series, Table 26" x 30", Jolt 1500 lbs.
1—HERMAN #750 Series, Table 20" x 30", 750 lbs. Jolt.
6—INTERNATIONAL "R" Core Rollovers.
1—INTERNATIONAL "G" Size 20" x 8".
1—INTERNATIONAL "G" Size 24" x 10".
1—INTERNATIONAL "G" Size 30" x 12".
1—INTERNATIONAL No. RES, Size 15" x 8".
1—INTERNATIONAL Type "F," 31" x 54", Draw 16", Jolt Cap. 2500 lbs.
1—JOHNSTON & JENNINGS #612-RP, Table 24" x 30", Draw 12", Jolt 600 lbs.
1—MILWAUKEE #167, Table 32" x 33", Draw 12", Jolt 1000 lbs., Sq. Cyl. 16".
1—MILWAUKEE #217, Table.
2—OSBORN No. 142, Table 14½" x 24", Draw 8", 350 lbs. Jolt.
10—OSBORN No. 40 and 42, Hand Core Rollovers, 18" x 8" Draw.
1—OSBORN No. 342, Table 23" x 38", Draw 10", Jolt 1000 lbs.
1—OSBORN No. 442, Table 21" x 31", Draw 10", Jolt 600 lbs.
1—OSBORN No. 242, Table 29" x 42", Draw 19", Jolt 1500 lbs.
2—OSBORN No. 405, Table 57" x 64", Draw 26", Jolt 3000 lbs.
6—OSBORN No. 601, 30" wide Flask, 10" Draw, 750 lbs. Jolt.
6—OSBORN No. 602, 36" Wide Flask, 10" Draw, 750 lbs. Jolt.
2—OSBORN No. 332, Flask Size 26" x 36", Draw 9", Sq. Cyl. 16", 1500 lbs. Jolt.
1—SPO No. 413D, Table 24" x 25", Draw 10", Jolt 600 lbs., Sq. Cyl. 13".
3—TABOR, Size 30" x 40" Table, 12" Draw, 1000 lbs. Jolt Cap. Portable & Stationary.
4—TABOR Size 22" x 32", and 22" x 42", Draw 10", Jolt 600 lbs.

JOLT PIN LIFT

1—DAVENPORT No. 40 AJS, Table 44" x 54", Jolt 4000 lbs., Draw 18".
1—INTERNATIONAL Model JDP, Size 600 x 8".
1—INTERNATIONAL Model JDP, Size 1600 x 10".
1—INTERNATIONAL LP10, 30" x 30" Table.
1—MILWAUKEE No. 1536, Table 32" x 38", 1500 lbs. Jolt.
2—MILWAUKEE No. 620 ND, 24" x 30" Table, 2000 lbs. Jolt.
2—OSBORN No. 559, Table 25" x 30", Draw 6", Jolt 1200 lbs.
1—OSBORN No. 563, Table 55" x 63", Draw 12", Jolt 7000 lbs.
1—TABOR, Table 22" x 32", Draw 10", Jolt 600#.

JOLT SQUEEZE PIN LIFT

1—INTERNATIONAL PKL, 12", Squeeze Cyl., 6" Draw.
1—MILWAUKEE 125-3, Table 21" x 27", Jolt 1200 lbs. Draw 8", Squeeze Cyl. 12".
2—MILWAUKEE No. 165, Table 24" x 34", Draw 8", Squeeze Cyl. 16".
1—MILWAUKEE No. 163, Table 15" x 24", Draw, 8", Jolt 1500 lbs., Squeeze Cyl. 16".
2—OSBORN No. 710 Table 17" x 21", Squeeze Cyl. 10".
4—OSBORN No. 716 PJ, Table 22" x 34", Draw 7", Squeeze Cyl. 16".

JOLT (BUMPERS)

1—HERMAN, 40" x 60" Table, 13" Cyl. 6000 lbs. Jolt.
1—MILWAUKEE No. 4050, 40" x 50" Table, 12" Cyl.
1—TABOR, Table 30" x 40".

MATERIAL HANDLING EQUIPMENT

1—INGERSOLL RAND, Size MHU, Air Winch, 2000 lbs. Cap.
1—LINK-BELT Car Puller, 5000 lbs. cap. (3 s. Cars).
6—READY POWER UNITS, 4 & 6 Cylinder.
3—AUTOMATIC Fork Pallet Trucks, 4000 lbs. cap. 7" Lift.
6—LEWIS SHEPPARD Platform Hand Lift Trucks (For Core Room).

CONVEYOR BELTS

1—JEFFREY Trough, 24" x 75' centers.
1—JEFFREY Trough, 24" x 103' Centers.
1—JEFFREY Trough, 24" x 385' Centers.
1—JEFFREY Trough, 24" x 145' Centers.
1—JEFFREY Flat 24" x 385' Centers.
1—LINK BELT Flat 24" x 40' Centers.

STEEL APRON

1—JEFFREY 24" x 60' Centers.
1—JEFFREY 24" x 117' Centers.

VIBRATING

1—SIMPLICITY Model OA-10-JA, 18" x 16'.
3—SIMPLICITY Model OA-10-A, 36" x 15'.

PORTABLE TROUGH

1—FARQUHAR, 18" x 35'.

UNDER CAR UNLOADER

1—FARQUHAR, 18" x 19'.

TRAMRAIL

3—LOUDEN MONORAIL SYSTEMS, "Super Track"
(1) 110' of 6" I-beam & two 20' bridges
(2) 140' of 6" I-beam & two 12' bridges
(3) 130' of 11" I-beam & two 30' bridges; All Complete.

OVERHEAD CRANES

1—WHITING 5 ton Overhead Crane, 50' span, Cab Operated, AC.
1—SHEPARD NILES Overhead Crane, 66½' span, 15 Ton Cap.
1—ELECTRIC BRIDGE Crane, 25' Span, with 2 Ton R & M Hoist, 150' track.

MOLD DRYERS

1—PORBECK Mold Dryer, 42" wide, 8' long, oil fired, Serial No. 242.

MOLD CONVEYOR

1—WEBB 109 Cars, Car Tops 32" x 39".
1—LINK BELT, 98 Cars, Car Tops, 32" x 39".

SAND MULLERS

1—BEARDSLEY & PIPER, #30 with Skip Hoist & Dust Hood, 20 HP.
1—BEARDSLEY & PIPER, #50 with Skip Hoist, Dust Hood, 50 HP.
1—BEARDSLEY & PIPER, #70 with Dust Hood, 100 HP Motor.
1—BEARDSLEY & PIPER, #3½ MULBARO with Spare Barrow.
1—CLEARFIELD, #404 Batch, 4 Cu. Ft.
1—CLEARFIELD, #610 Batch, 6 Cu. Ft.
1—SIMPSON, #1 Style B, Single Wheel. 400# Batch.
1—SIMPSON, #3 Style C, Enclosed Gears —3000#.
2—SIMPSON PORTAMULLERS.
1—SIMPSON, #2, Style UD, 1500 lbs. Batch.
1—SIMPSON, #2, Style C, 1500 lbs., with Loader. Enclosed Gears.

SAND PREPARATORS

1—B & P, No. 40, 40 Ton Hopper.
1—B & P No. 70, 70 Ton Hopper.
6—B & P Screenarators, Models—S, M & L.
1—PEKAY Aerator, Model 320-3. (For Sand System).
8—ROYERS, Models NDP-C-2.

SAND CUTTERS

1—AMERICAN, Model BD-Size 75/60
1—AMERICAN, Model M-Size 99/80.
1—AMERICAN, Model M-Size 89/70

SAND SLINGERS

1—B & P, 19" Tractor Type, 13' Arm.
1—B & P, 16" Tractor Type, 13' Arm, Magnetic Tower, 4' Ramming 4" Tip.
2—B & P, Model 16S-DB Stationary Type, 16" Head.
1—B & P Stationary-Double Belt Model, 5' arm, 4' Ramming, 19" Head, 4" tip. Never Used.

SHAKEOUTS & SCREENS

4—SIMPLICITY 4' x 8' Model D, 16,000#.
4—SIMPLICITY 4' x 6' Model B, 5000#.
1—SIMPLICITY 4' x 10' Model D, 16,000#.
3—SIMPLICITY 3' x 6' Model BG, 5000#.
1—SIMPLICITY 6' x 8' Model DE, 32,000#.
1—ROYER Combination Shakeout & Sand Conditioning unit, Serial #ST-47.
1—HEWITT-ROBINS 36" x 78", Vibrex Screen, Style M-7.

TUMBLING BARRELS

1—ROYERSFORD 36" x 60", 5 HP Motor.
2—SLY 42" x 72" Square, 10 HP, Gearhead with Built-in Brake. Timken Bearing.
2—SLY 36" x 84" Type C, 7½ HP, Gearhead with Built-in Brake. Timken Bearing.
4—WHITING 48" x 72", 10 HP Gearhead, with Built-in Brake. Timken Bearing.

WHEELABRATORS

1—AMERICAN 27" x 36" Tumblast with Skip Hoist Loader.
1—AMERICAN 36" x 42" Tumblast with Skip Hoist.
1—AMERICAN 42" x 48" Tumblast, with Skip Hoist.
1—HOLLINGSWORTH Model 44" x 48" Tumblast.
1—PANGBORN Shot Blast Room 10' x 12' x 14', with Dust Collector, Elevator, etc.
1—PANGBORN 9LG. 9' Table, 8-24' Tables.

TESTING EQUIPMENT

1—GENERAL ELECTRIC X-Ray, Industrial Type, Model KX10., 140 KW.
1—STEEL CITY Brinell Hardness Tester, Model UK 300, To 3000 Kilograms.
1—STEEL CITY Brinell Hardness Tester, Model 0-4500 4¼" Piston.
1—DIETERT Complete Lab. for Sand Testing.

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BARGAIN PRICES

GUARANTEED REBUILT EQUIPMENT

BLOWERS
1—85 HP G.E. Cupola Blower, 24 oz.
3—7½ HP FISHER, 16 oz.
15—CENTRIFUGAL BLOWERS, 350 CFM to 10,500 CFM.

CLEANING EQUIPMENT
1—AMERICAN #1 MULTITABLE, 6 aux. tables 15", main table 45".
SHAKEOUT 4' x 6'.
1—AMERICAN #2 MULTITABLE, 5 tables, 37" dia.
5—US GRINDERS, double end, 10, 15, 20 HP.
4—GRINDERS, Swing frame, 15 HP.
2—TUMBLING BARRELS, Cast Iron, 36" x 24" w/2 HP Motor.
2—TUMBLING BARRELS, Square, 34" x 48".
2—TUMBLING BARRELS, Side Tilt, 18" wide x 20" deep.

CONVEYORS
1—LINK BELT Double Deck Oscillating, 80' long x 24" wide, 1954.
1—45' x 24" wide APRON CONVEYOR
4—SAND ELEVATORS, various sizes.
1—STEEL PLATE MOLD, 90' centers, 30" belt, w/drive.
2—STEEL PLATE MOLD, 90' centers, 24" belt w/drive.
6—SAND BELT CONVEYORS, 10' centers to 140' centers, 18" to 36" belt, complete w/drives and hoppers.
2—CASTING CONVEYORS, wire mesh, 18" x 32" w/drive.

CUPOLAS
2—WHITING #6, Complete with Skip Charger.
1—WHITING #5, w/Skip, Spencer Blower, Foxboro controls, 2 yrs. old.
1—MORRIS #9, w/skip, mixing ladle, never used.
1—MODERN, #3, 46' shell, w/blower.
2—MODERN #7; Blowers & Controls.
1—SKIP CHARGER, 3 bottom drop buckets, scale for #9 cupola.

CORE BLOWERS
1—3K DEMMLER.
1—SB 13 INTL.
6—#2 DEMMLER.
1—CB-400 CHAMPION.
1—#55 DEMMLER.

FLASKS
150—HINES & FREEMAN ALUM. Pop-offs and jackets, send for list.
TRANSITE CORE PLATES, send requirements.

FURNACES—DIRECT ARC MELTING
1—250#/hr. Hydraulic Top Charge.
1—3000#/hr. LECTROMELT.
1—1000#/hr. HEROULT.
1—2,000#/hr. HEROULT.
2—3000# HEROULTS.
1—3 Ton HEROULT.
1—6 Ton HEROULT.

FURNACES—INDIRECT ARC
1—60# DETROIT, complete.
1—350# cap. DETROIT, complete.
1—1000# cap. DETROIT, complete.
1—2000# DETROIT, complete.

FURNACES—INDUCTION MELTING
1—500 KW AJAX, complete.
1—300 KW AJAX, complete.
1—175 KW AJAX, complete.
3—333 KW, AJAX-TAMA-WYATT, 1500# Alum.
2—60 KW AJAX, 60 Cycle, 400#, Alum.
1—7½ KW TOCCO
1—20 KW AJAX Spark Gap High Freq.
1—3 KW AJAX, Lab. type.
1—30 KW LEPEL.
1—50 KW, G.E., MG Set, 960 cycle.

FURNACES—OIL AND GAS
1—FISHER 4 Burner MNP, 1700#, gas.
4—FISHER, Stationary Holding, 500#, gas.
3—WALKER YORK #400 cruc. tilting, coke fired.
1—SKLENAR 600#, Oil fired.
1—HAUSFELD Tilting, 1200# Mag.
1—R & S Convection Draw, Car bottom, 18' l x 8' w x 5' h, oil fired, dismantled, controls.

MOLDING MACHINES
Jolt Rollovers
2—J & J #1020, 50" x 60", 20" draw, 1953.
1—J. & J. #918, 44 x 54", 18" draw.
1—OSBORN #405, 64 x 50", 18" draw. 3000#.
1—J & J #612, 24" x 30", 12" draw.
2—J & J #815, 30" x 40", 15" draw. 1200# jolt.
1—HERMAN, 8' x 12' Table.
2—HERMAN, 1500#, above ground.
2—HERMAN, 20" x 24", 750#.
1—HERMAN, 50" x 72", 6000# jolt.
1—HERMAN, 42" x 78", 6000# jolt.
1—OSBORN, #243, 27" x 40", 20" draw.
4—TABOR, 22" x 42", pattern draw, port.

Bumpers
1—OSBORN #102.
1—HERMAN, 60" x 72".

Jolt Strippers
1—MILWAUKEE #1536, 32" x 38".
1—SPO, 24" x 24".

Jolt Squeeze Strippers
1—OSBORN #175, 21" x 18", portable.
2—MILWAUKEE #163.
1—MILWAUKEE #165, 16" Pin Strip
1—MILWAUKEE #124-6, 12" Pin Strip.

Jolt Squeezers
2—INTERNATIONAL, 17" x 20", port.
1—OSBORN #212 PJ, 17" x 23", stationary.
4—OSBORN #276-J.
3—OSBORN #275-J.
3—TABOR, 18" x 20", 3" jolt, column.
1—TABOR, 18" x 20", 3" jolt, cantilever.
1—ADAMS, 19" x 20" portable.
2—SPO #213-GP
1—SPO #110-J

LADLES & POURING DEVICES
2—WHITING 3 Ton. Bottom pour.
4—10 TON BOTTOM POUR, 55" x 55".
2—45 TON TREADWELL, Excellent.
4—800# Worm Geared, Lip Pour
3—1500# TEAPOT, Lip Pour, Worm Geared.
3—5 Ton to 9 Ton, Worm Geared, Lip Pour.
1—SWINDELL, Elec. Holding.

MULLERS AND MIXERS
1—SIMPSON #0
1—SIMPSON #3, enclosed gears.
2—SIMPSON #2, Unit Drive.
2—CLEARFIELD #610 and #920.
1—B & P SPEEDMULLER, #70.
1—BEARDSLEY & PIPER #60 SPEEDMULLER, 60 HP motor, SKIP-LOADER.
1—B & P MULBARO, #7, extra Base.

OVENS
1—FOUNDRY EQUIP. CO., 2 comp., rack 12'-10" x 15'-8" x 7'-10"; oil, external recirculating.
1—TOWER CORE OVEN, 14" x 60" trays, 45' high, gas fired, dismantled.
2—ROSS 2 comp., rack, gas, 6½ x 14 x 7.
1—PORBECK, 4 drawer, double end, oil.
1—YOUNG BROS. 3 compartment, kiln type electrically heated, with CONTROLS.
1—YOUNG BROS. 2 compartment, drawer type, oil or gas, 82" h x 12' w x 6' l.
1—YOUNG BROS. 3 door, gas, 12' x 8' x 6'-3", recirculating, blower and recorder.
1—COLEMAN, Oil, 2 Comp., Rack Type. Recirc; each comp. 60" wide x 80" high x 14'-6" deep.
1—COLEMAN, Double Door, Oil, Single Comp., Recirc., 60" wide x 14'6" deep x 80" high.

SAND CUTTERS
4—AMERICAN SAND CUTTERS.
1—MODEL "K", 72" reel, Gas Driven.
1—MODEL "F", 80" reel, Gas Driven.
1—MODEL "D", 76" x 96".
1—SANDMASTER, 70/102, New in 1950. Rubber Tires.

SAND LABORATORY EQUIPMENT
1—Complete SAND LABORATORY
1—TEST CORE BAKING OVEN #606.

SAND PREPARATORS
2—JEFFREY SANDITIONERS, Portable.
2—ROYER SAND BLENDERS, 16" belt.
5—ROYER SAND BLENDERS, 12" belt.
1—LINK BELT REVIVIFIER, Size 5.
1—HETHERINGTON & BERNER SAND DRYER, rotary, oil fired #552.

SAND SLINGERS
1—BEARDSLEY & PIPER MOTIVE JR. 19" head.
1—BEARDSLEY & PIPER TRACTOR TYPE 16" head magnetic separator.
1—PORTABLE SLINGER 16" head, 4' long, on Truck.

TESTING MACHINES
1—TINIUS OLSEN, UNIVERSAL, 100,000# capacity.
1—TINIUS OLSEN, BRINELL HARDNESS, 3,000 KG.
1—RIEHLE, UNIVERSAL, 2 screw mechanical, 100,000# capacity.
1—BALDWIN, UNIVERSAL, Hydraulic tensile, 60,000#.

TRUCKS
1—HOUGH PAYLOADER, Model HA. Hydraulic Trip.
2—BELL PRIME MOVERS, 1000# capacity, gas driven.
1—LEWIS SHEPPARD, 4000#, elec. Fork Lift.

MISCELLANEOUS
1—GARDNER VERTICAL DISC GRINDER.
6—PENN DUMP BUCKETS, 1000# to 4 ton.
4—CURTISS AIR HOISTS, barrel type.
1—HOFFCO Vacuum Cleaner, #75.
1—ALLEN-BILLMEYER Vacuum Cleaner. port.

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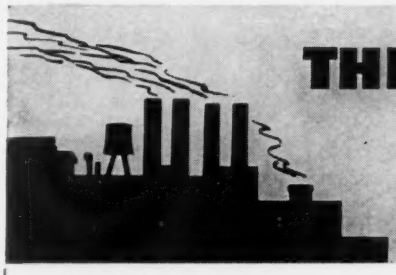

THE ACME *bargain page*

AIR COMPRESSORS
Ingersoll Rand Type 10—14 x 9 x 12, 2 stage, 75 Hp, 3/60/220/1200 rpm synchronous motor, 350 CFM at 100#.
Ingersoll Rand Type 10, 800 CFM, 2 stage air compressor, 200 HP, 220 V motor. Rebuilt 1952.

AIR HOISTS
6—4000# Ingersoll-Rand, with trolleys.

BLOWERS
Ingersoll-Rand Motor Blower Type FS. Single Stage 4000 CFM @ 3.75 PSI, 100 HP, 220V G. E. Induction motor.
General Electric 7500 CFM, 20 oz., 89.6 Max. HP, 220V motor, Airway controls.
Ingersoll-Rand turbo compressor 10500 CFM @ 20 oz. 85 HP G. E. 220V 3500 CFM motor.

CLEANING EQUIPMENT
Sly 8′ dia. Table Shot Blast Unit.
36 x 42 Halloway 7½ HP shot motor elevator and dust collector.

CORE BLOWERS
3—International SB 12.
4—International SB 13.
10—Osborn 193.
1—Osborn 2035-2.
1—Peterson (Similar to Demmler #50).
1—Champion CB 400.

CORE GRINDERS
6—Milwaukee 70-12 and 70-9.

CORE OVENS VERTICAL HORIZONTAL
1—Coleman, combination oil or gas fired 43 carriers 24″ x 90″—1 hour 12 min. to 4 hours 48 min. cycle.
1—Coleman, combination oil or gas fired 43—2 shelf carriers 30″ x 144″ long. 2 hour 12 min. to 7 hour 24 min. cycle. Present replacement cost over $90,000.

CORE PASTE OVENS
3—Coleman Gas Fired 28′-25″ x 42″ opening Complete.

CRANES
1—Milwaukee 10 ton 40′ span, 22′ lift, 220 V. A.C.
2—Northern 5 ton 40′ span, 22′ lift, 220 V. A.C.
1—Whiting 5 ton 40′ span, 22′ lift, 220 V. A.C.

GRINDERS
Horizontal Disc (Flat) Grinders:
Gardner #186, 30″ dia. disc. 10 HP, 220/440V, with dresser, wet or dry grinder.
Gardner HV5A, 18″ dia., 7½ HP, 440V, with dresser.
Double End Disc:
2—U.S. 18″ wheels, 2 swing tables, 1 with lever feed.

GRINDERS, SNAGGING
2—Hammond 10 WRI Double End Snag. Grinders 20″ dia. wheels, 10 HP 220/440 v motors, variable speed drives.
2—3″ x 24″ U.S. #65, 20 HP 220/440V.

GRINDERS, SWING FRAME
2—3″ x 24″ x 12″ Fox #4, 15 HP.
1—3″ x 24″ x 12″ Marschke, 20 HP.
1—3″ x 24″ x 12″ U. S. 15 HP.

HOT METAL CARRIERS
3—1 ton D.C. Cab operated Cleveland, Monotractor Hot Metal Carriers.

MOLDING MACHINES
Jolt Squeezers:
5—Milwaukee 103-11 Staty. Jolt Squeezers, 13½″ x 20″ table.
7—Champion JS10P Portable Jolt Squeeze molding machine. 18″ x 21″ table.
5—Osborn 275J.
1—Spo 110J.

Jolt Squeeze Pin Lifts BIG
2—International PK 20's. 20″ squeeze cylinder 8″ draw. Ser. #67237. New 1949.
2—Milwaukee Jolt Squeeze Strippers, Model 168-50, 15″ x 24″ table 16″ X open end pattern size.
1—Milwaukee 126-3 Jolt Squeeze Pin Stripper, 27″ x 21″ table, 8″ draw. Portable.
3—#165 Milwaukees.

ROLLOVERS
Jolt Rollover Pattern Draw
1—Herman 4000# Series 30″ x 60″ table, 32″ x 48″ bumper.
1—Herman 3000# Series 40″ x 84″ table, special slotted table.
1—Herman 1500# Series 20″ x 36″ table.
2—Herman 750# Series 20″ x 30″ table.
2—Herman 750# Series 20″ x 24″ table.
1—Davenport 24 SA Jolt Rollover Pattern Draw. 26″ x 42″ flask size, 12″ draw.
3—Spo Model 9032.
1—Milwaukee 217.
2—International Type G, Portable, 20″ x 8″ draw.
2—Tabor Portable Rollover 30″
Johnson & Jennings 1020-44 x 44 max. Flask Size.

PIN LIFT PUSHOFFS
2—Champion Pin Pushoffs 28″ x 42″ table 10″ draw.

MULLERS AND MIXERS
Simpson #3 Type H open gear type.
Beardsley & Piper #70 Speedmuller, New style cross head.

OVENS, MOLD OR CORE
Porbeck Double Car Single door 16′ long 14′ wide 7½ HP car puller, in place St. Louis, Mo.
Despatch Type S, 2 cars 27½ x 54 x 64, Gas Fired.

OVERHEAD TROLLEY CONVEYORS
5000′ Jervis B. Webb & Link Belt 658 chain, 4 D.C. motor drive and MG set.

POURING DEVICES
3—Pouring devices, Whiting 500#.

SANDBELT CONVEYORS
160′-30″ Trough with Drives.
123′-30″ Trough with Drives.
144′-30″ Flat with Drives.
47′-30″ Trough with Drives.

SAND CUTTERS
1—Model M Screenarator.

TUMBLING BARRELS
1—Sly 36 x 72
3—Royersford 42′ x 72′ Roller Bearing, Chain Drive.
1—Sly Square 42 x 42 x 64.
1—Sly 42″ Dia. x 56″.

STRAIGHTENING PRESS
Hannifin 50 ton hydraulic

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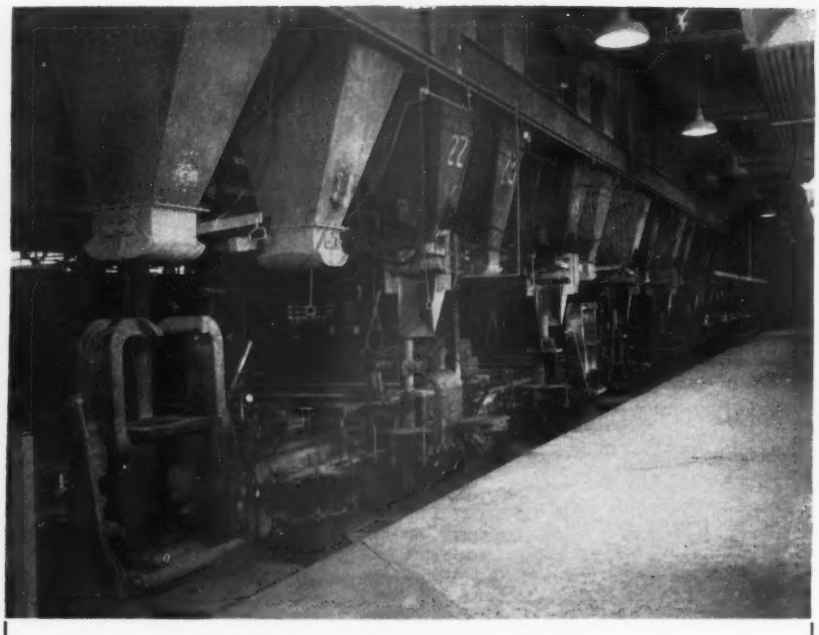

SAND SYSTEM — NEW 1949
"Acquisition Cost $400,000.00"

Consisting of:

2—SIMPSON No. 3 Unit Drive Sand Mullers, air operated Gates, Dust Hoods, automatic timing, etc.
1—SAND STORAGE Hopper, 120 tons.
1—WEBSTER 36" x 20' Apron Feeder under Sand Hopper.
1—ROBBINS Vibrex Screen, 48" x 120".
1—ROBBINS Return Sand Conveyor, 24" x 37', with Dings 24" Magnetic Pulley.
1—ROBBINS Return Sand Bucket Elevator, 18" Belt, 46' high.
1—ROBBINS Return Sand Belt 24" x 20'.
1—ROBBINS Distributing Sand Belt over Storage Bin, 24" x 22'.
1—ROBBINS Conditioned Sand Bucket Elevator, 18" belt, 37' high.
1—ROBBINS Distributing Belt Conveyor, 24" x 160'.
23—ROBBINS Molders Hoppers with Bradford Vibrators for above Belt.
1—ROBBINS Aerator with 24" x 10' Conveyor.
1—ROBBINS 24" x 160' Sand Spill Conveyor Belt.
160' Steel Grating for above.
1—ROBBINS 36" x 164' Vibra-Veyor for Shakeout Sand & Hot Castings.
1—WEBSTER Apron Conveyor 36" x 54" for Castings from Vibra-Veyor.
1—SYNTRON #F-5 Feeder Conveyor 30" wide by 78" long, with Controller.
1—AMERICAN Rotoclone Type N, Size #12, sludge ejector, wet.

AIR COMPRESSORS

1—GARDNER-DENVER 9 x 9 Type R9CG, 40 HP Motor, S/N 88395 with Magnetic Compensator, Air Receiving Tank.
1—INGERSOLL RAND Model ES1, 14 x 13, 100 HP Motor, S/N 76711, with Magnetic Compensator, Air Receiver.

AIR HOISTS

30—KELLERS, 500, 1000 lb. capacity.
6—INGERSOLL RAND Size C, 2000 lb.
3—INGERSOLL RAND Size E, 10,000 lb.

CORE ROOM SAND MULLERS

1—SIMPSON No. 1, 4 cu. ft., 10 HP Motor & Reducer, Dust Hood.
1—BLYSTONE Paddle Type Sand Mixer, 3 cu. ft. capacity, with 3 HP motor.

CORE OVENS

1—BAKER Single Compartment gas fired, recirculating, with L & N controls; I.D. 113' L, 48" W, 78" H.
5—MAEHLER Single Compartment, gas fired, recirculating, with L & N controls; I.D. 96" L, 80" W, 84" H.
2—MAEHLER Two Compartment, gas fired recirculating, with L & N controls; I.D. 78" L, 48" W, 84" H.
50—Core Racks—assorted sizes.

CORE ROLLOVER MACHINES

10—INTERNATIONAL Type R, portable.
4—INTERNATIONAL Type RP, 24" x 10".
3—INTERNATIONAL Type GR, 30" x 12".
3—INTERNATIONAL Type RJ, Size 20 x 8.
3—INTERNATIONAL Type RJ, Size 16 x 6.

CORE ROOM BLOWERS & MISC.

1—INTERNATIONAL SB-11 Core Blower.
25,000 lb. of Aluminum Core Plates.
12—ROSS Single Unit Core Drawers.
6—ROSS Double Core Drawers.
1—STONEY Core Grinder, 16" wheel, 48" travel.

CONVEYOR BELTING (never used)

300' HEWITT-ROBINS 24" wide, 4 ply, 32 oz. duct, 3/16" x 1/32" rubber cover.
400' HEWITT-ROBINS Elevator Belt 18" wide, 8 ply, 35 oz., 3/32" x 1/16" top.

CLEANING EQUIPMENT

3—MOTT Sand Blast Barrels, Type ES1.
2—MOTT Hand Cleaning Cabinets.
2—MOTT Sand Blast Rooms.

TRIMMING & POLISHING

4—CRESCENT Metal Cutting Band Saws, 32", 36", 42" Throats.
1—DEWALT Model ME2 Metal Cutting foundry type Radial Cut-off Saws.
5—L'HOMMEDEAU Polishing Lathes No. 20-B double wheel, with 10 HP.

CORE KNOCKOUT SYSTEM

New 1954—Consisting of:
24" x 60' Horizontal Belt under Shakeout.
SIMPLICITY 3' x 8' Shakeout.
Incline Belt 24" x 105' Belt, 18" x 24", Dings Magnetic Pulley, MG Set.
JEFFREY 24" x 20" Double Roll Core Crusher, with 15 HP GE Motor.
Overhead Storage Bin, 25 ton cap.

SHAKEOUT

1—SIMPLICITY 4' x 8' Shakeout, Model D, 16,000 lb. capacity. With 20 HP Motor.

MELTING FURNACES

25—LINDBERG FISHER Type ATC No. 450 Crucible, stationary, oil fired.
3—LINDBERG FISHER No. 1000 Crucible stationary, oil and gas fired.
3—MONARCH Reverberatory 2000 lb. cap. Hand Tilt oil and gas fired.
2—FISHER MNP Nose Pour Tilting, 1700 lb. cap., oil fired.

MOLDING MACHINES

10—INTERNATIONAL LJS Jolt Squeezers, 10" Squeeze cyl., stationary.
2—INTERNATIONAL PKL Jolt Squeeze Pin Lift, Size 14 x 5½.
2—INTERNATIONAL PKL Jolt Squeeze Pin Lift, Size 12 x 5½.
1—INTERNATIONAL RES Jolt Squeeze Rollover Draw, Size 14 x 6.
2—INTERNATIONAL Type F Jolt Rockover Pattern Draw, Size 25 x 8.
3—INTERNATIONAL JDP Jolt Pin Lift Machines, Size 600 lb. x 8".
2—INTERNATIONAL JDP Jolt Pin Lift, Size 1200 lb. x 10".
2—INTERNATIONAL GS Jolt Rollover Pattern Draw, Size 24 x 7.

HEAT TREAT FURNACES

1—INDUSTRIAL Normalizing Car Type Gas Fired, recirculating with L & N controls; I.D. 7' L, 5' H, 8' W.
5—UNIVERSAL Type ES Batch Type gas fired, recirculating Single Compartment; I.D. 57" L, 48" W, 57" H, with L & N controls, complete with Baskets, 1200° F.
2—UNIVERSAL Quench Tanks, with Heaters and L & N controls.

TRAMRAIL SYSTEMS

5—AMERICAN, consisting of 75' long runways, with nine 20' span bridges, rated capacities from 1-ton to 5-ton.
1—AMERICAN, consisting of 200' of Tramrail and two 12' bridges with trolleys; hand operated, 1-ton capacity.
1—AMERICAN, consisting of 225' of 10" I-beam runways, with 3 bridges 30' span, 3-ton capacity.

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2743 W. 36th Place • VIrginia 7-1900 • CHICAGO, ILLINOIS

ELECTRIC melting furnaces

BUY FROM SPECIALISTS...LARGEST, MOST COMPLETE STOCKS

1—Swindell 8 ton 9' diameter Shell Electric Furnace, 2500 KVA transformer, 13,800 or 11,000 V. In our Chicago warehouse.

Swindell Electric Furnace, 5' dia. shell, 350 KVA, 6600 volts.

Swindell Electric Furnace, 4' dia. shell, 250 KVA, 6600 volts.

Swindell Electric Furnace, 5' dia. shell, 500 KVA, 6600 volts.

Allis Chalmers Induction Melting Furnace, 2-600# pots.

Ajax Northrup High Frequency Induction Furnace, spark gap type, 35 KVA with 60# and 17# melting pots.

1—Detroit Electric, 1500# capacity, 13,200 primary voltage. Kuhlman transformers. Complete with controls.

Detroit Electric 350#, Type LFA with Kuhlman transformers and oil circuit breaker, 13,200 primary voltage.

Pennsylvania 1500 KVA transformer, 12,000 V. Never used since rebuilt. With complete controls, mostly new, needed for operation of a furnace. New control panel, Field Rheostat, 25 HP, 440 V MG set.

1—1500 KVA G. E. Transformer with taps for 11,000 or 13,800 volts.

Transformers—2—2500 KVA furnace transformers, 11,000 or 13,800 primary voltage.

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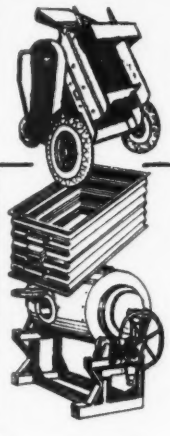

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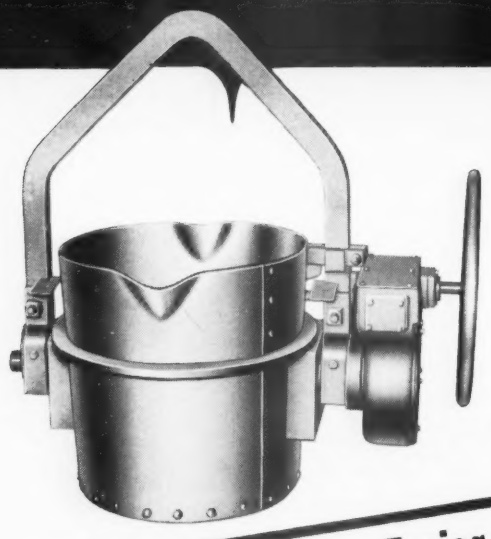

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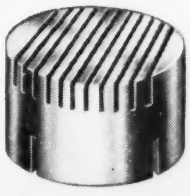

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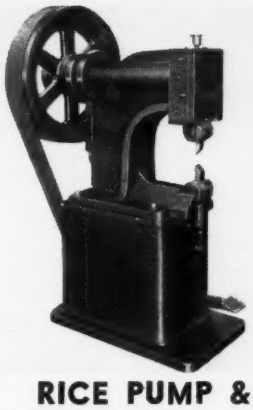

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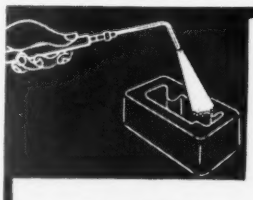

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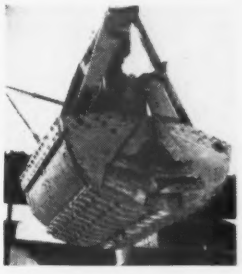
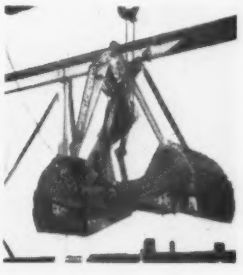


Use this versatile *dual-purpose* bucket for efficient coke handling. Without the liner plates, the shark teeth literally finger their way through the coke so it can be handled with minimum degradation. Hook-on feature permits quick change for other foundry service requirements.

BLAW-KNOX "SHARK TOOTH" BUCKETS *with liner plates* HANDLE SAND WITH MINIMUM LEAKAGE



This open head type Single-Line Hook-On Bucket *with liner plates attached* inside of the shark teeth, economically handles sand, coal, small limestone and granular fines with minimum leakage!

BLAW-KNOX SINGLE-LINE HOOK-ON TYPE BUCKETS FOR EXTREMELY LOW HEADROOM

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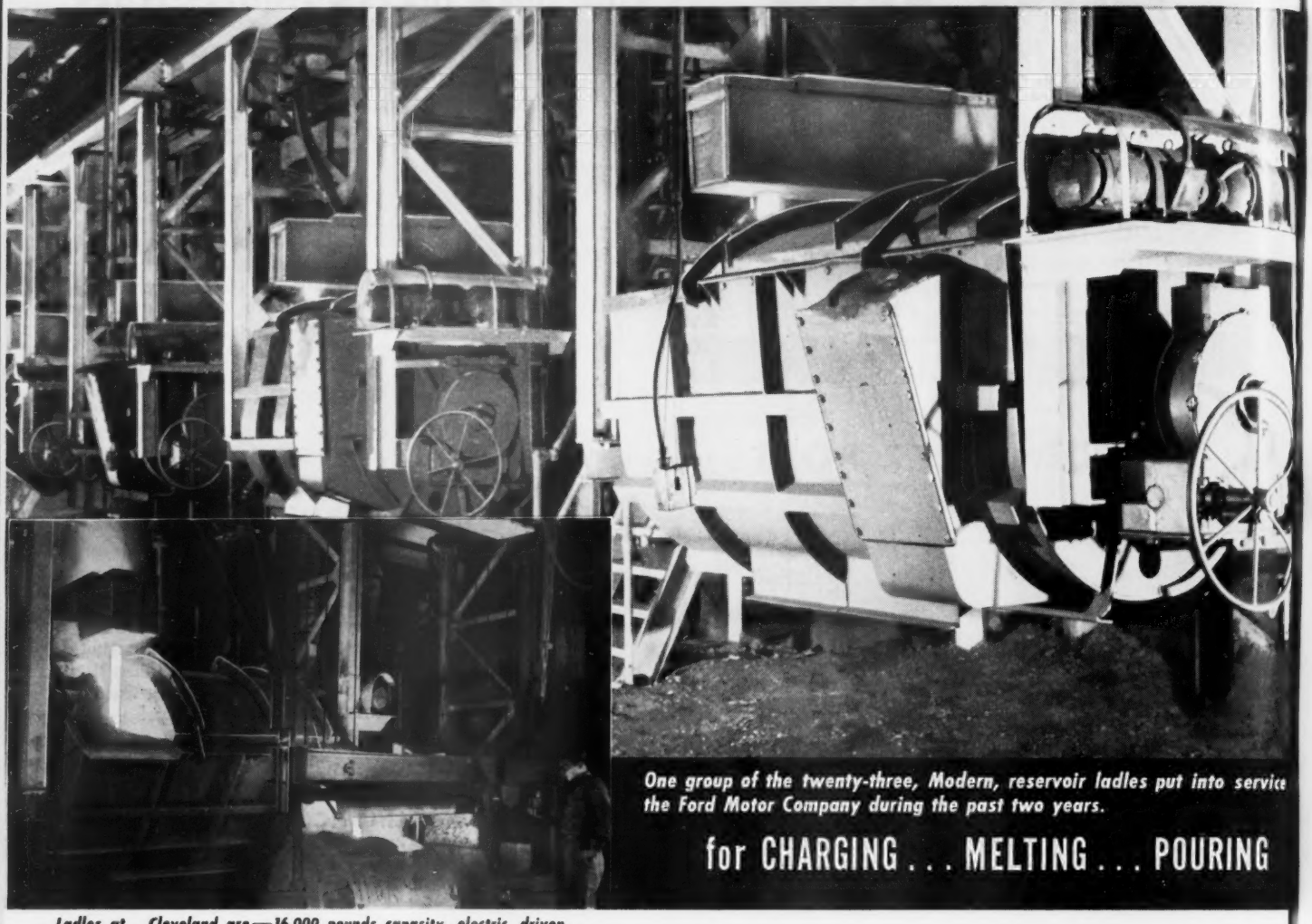

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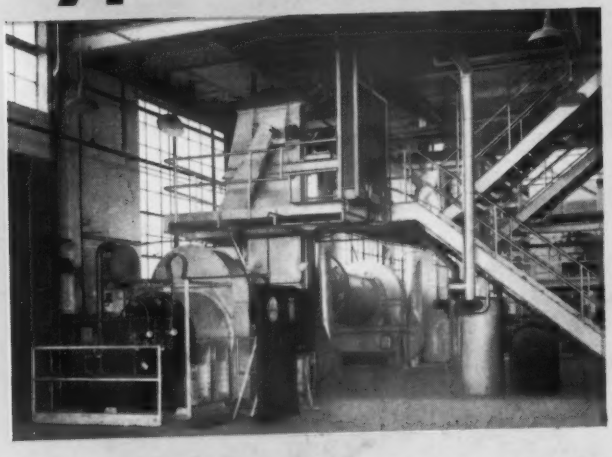

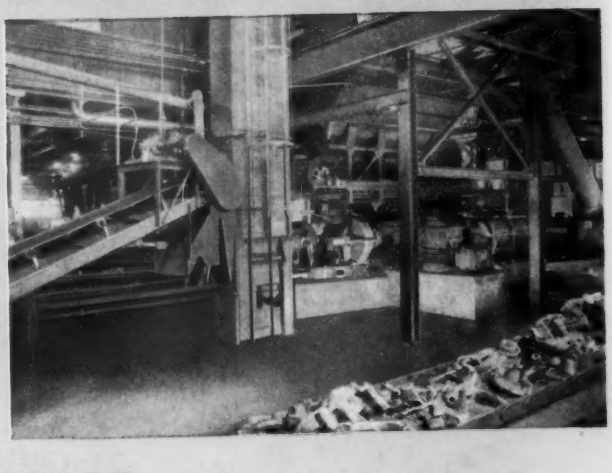

BARTLETT - SNOW

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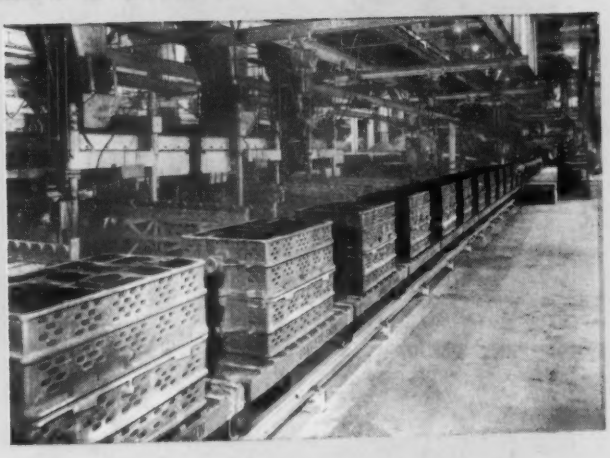

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